SCIENTIFIC AMERICAN

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IMPROVED DUMPING CART.

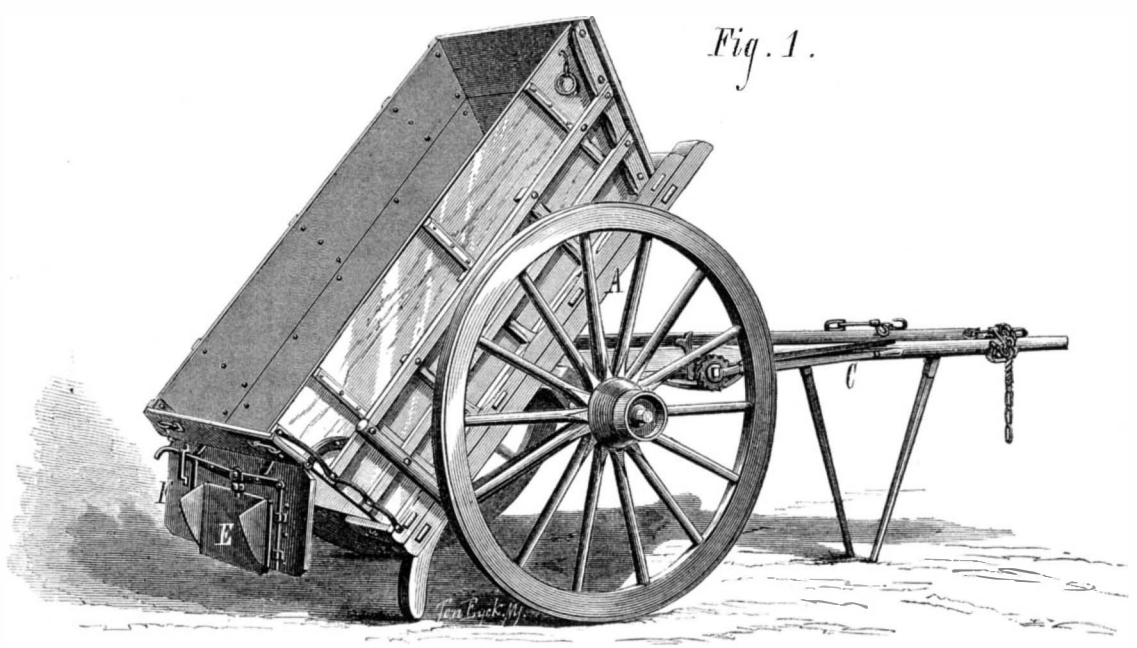
In the annexed engravings is illustrated a novel form of dumping wagon, which is so constructed that its load may be dumped by tilting the body of the vehicle rearward in the ordinary manner, or the load may be shot down an inclined chute attached to the rear of the body, the front portion of the latter being raised to facilitate the escape. The advantage of the chute attachment, for coal carts more especially, is obvious, since it admits of the load being delivered directly into the coal hole without being partially dumped into the street and gutter, or of being conducted at once to coal holes situated some distance back from the curb, thus saving considerable shoveling or transportation of the fuel in baskets.

A is an extra frame, which is jointed to the rear part of the shaft frame and rests on a pillow block on the axle, tilting thereon to dump in the ordinary way, as shown in Fig. 1. The front end of said frame is fastened to the shaft frame by hooks and staples. The rear end has hinged to it the bed frame of the box, so that the latter may be caused to rise at its front portion when the toggle bar, B, is elevated by means of a chain leading to the ratchet lever and shaft, C In this position, Fig. 2, the wagon is ready to deliver its contents to the chute, D, through the small gate, E. This gate has sides which form a portion of the chute, and is fitted in the main gate, F, Fig. 1, which last opens upward on hinges and is fastened by slide bolts and staples, the same devices combined with a compound lever serving to fasten both gates. The suspending rods, G, are connected to the chute by long staples, which allow the chute to be shifted along the rod to adjust it on the axle under the cart body for transportation.

The toggle bar, B, is jointed to the box frame so as to swing back. It can be adjusted over the chute when the latter rests on the axle; and by tightening its chain, the chute will be securely held in place. The end frame is provided with striking pieces, to drop on the ground and sustain the shocks when dumping in the ordinary way.

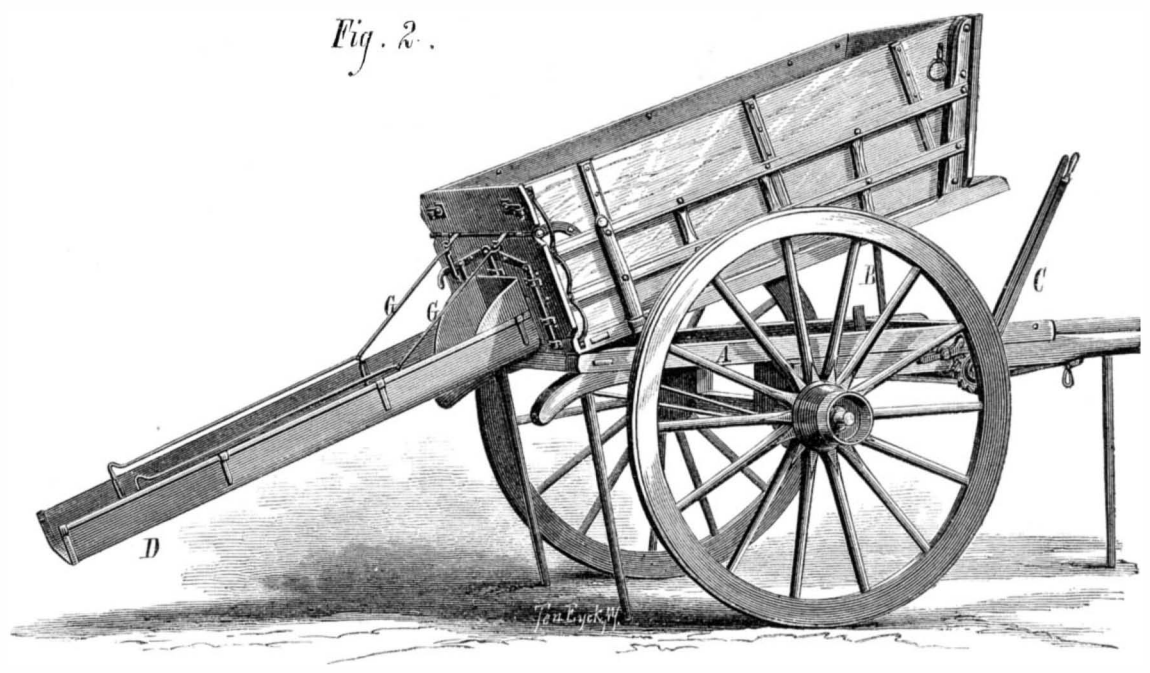
Patented through the Scientific American Patent Agency, November 30, 1875. For further information address the inventor, Mr. George B. Wiestling, engineer and superintendent, Mont Alto Railroad Company, Mont Alto, Pa.

Fig. 1.



WIESTLING'S DUMPING CART.

Fig. 2.



WIESTLING'S DUMPING CART.

The Death of the Captive Gorilla.

The only captive gorilla in existence recently died in the Zoölogical Gardens, in Dresden. The animal, a female, was long supposed to be a chimpanzee, and it was only lately that, to the surprise of all naturalists, her gorilla characteristics were recognized. The story of the death scene of this almost human monkey is a remarkable one, since it goes to show that the animal was the possessor of feelings hitherto deemed absent among the brutes. Says a writer in the London *Echo*: "As Director Schopf (the director of the gardens) leaned over his favorite, the ape drew him toward her, placed her arm around the neck of her kind friend, and looked at him for some time with clear and tranquil eyes; she then kissed him three times, with short intervals between each salute, motioned to be laid upon her couch, gave her hand to Schopf—as though bidding farewell to a companion of many happy years—and slept never to wake again."

A VEIN of galena twenty-seven feet thick has recently been struck in the Yosemite mine, Bingham cañon, Utah.

Photographing Sound.

Professor Vogel, in a letter to the *Photographer*, Philadelphia, Pa., says that König, at Paris, has constructed an apparatus, consisting of a little drum, over which is stretched a very elastic skin. A stream of gas let through this drum will burn as usual; but as soon as a tune (by singing) strikes the skin stretched over the drum, the gas light commences to shake in a wonderful manner; and if we look at it in a rotating mirror, we observe peculiar figures, which change according to the different notes; and by using a burning gas producing a light of great chemical effect, we can photograph these peculiar figures. What kind of gas will answer for this purpose is still an undecided question, but this much is certain, there are in this respect great problems yet to be solved; we may succeed, perhaps, in photographing speeches instead of stenographing them as usual.

Ten Millions of Gold in One Pile.

A San Francisco correspondent of the Philadelphia *Press* says that a well authenticated rumor is prevalent in San Francisco that the great bonanza kings, Messrs. Flood, O'Brien, Mackay, and Fair, are going to send one hundred and fifty tuns of the gold and silver bullion from their Consolidated Virginia Mine to the Centennial, and pile up the glittering bars in some conspicuous spot, so that all the world can see what one mine produces in five months! The value of the bars will be ten millions of dollars in United States gold coin! "If the idea is carried out, it will be the grandest sight among a million of grand sights, and I venture to say more people will visit this mountain of wealth than any other single thing in the buildings. Five millions of the bullion is now boxed up for shipment, and the balance will be ready in due season. Few people ever saw such a vast sum as ten millions of dollars in gold and silver, all in one or several piles; and I think the proposition of Messrs. Flood & Co., if carried through, will add much to the charm, the wonder, the *éclat*, and the success of the Exposition."

Torture by Electricity.

The punishment inflicted on garotters and on criminals who perpetrate brutal crimes on old people or on women, in England, is a whipping well laid on, and the effect is said to surpass any other means of preventing such crimes hitherto devised. A recent English writer thinks that our suggestion relative to killing murderers by the electric shock might be modified to suit the cases abovementioned; and he wants the legislature to authorize the substitution of the battery for the lash, so as "to produce absolutely indescribable torture (unaccompanied by wound or even bruise), thrilling through every fiber of such miscreants." No doubt a strong current, properly applied, would give infinitely more pain than a sound thrashing; but unfortunately, unlike the latter, its after effects might be serious. The lash does no permanent physical injury; but a too powerful current might shatter the nervous system and leave the possessor possibly paralyzed, thus condemning the sufferer to a penalty even worse than immediate death.

American Meat in England.

The London *Farmer* bears testimony to the remarkable success which has been met with in transporting American beef to England, from New York city. Our contemporary says: "As the quarters were stripped of their canvas wrappers and hooked up, the people gathered about, looked, and handled, and had to admit that, in quality and in clean marketable condition, the meat was equal to anything else on sale." Four carcasses were sent over in one recent lot, the average weight of which was 1,200 lbs. The whole weight of the consignment was 50 tuns, and it met with a quick sale at 14 cents a pound. In the same refrigerating room the carcasses of 20 pigs were brought over in excellent condition, and fetched 12 cents a pound. We have already explained the means of cooling the storage compartment, the principle being simple, the maintenance of a dry, cold atmosphere. The "Roast Beef of Old England," we fear, will find a dangerous rival before long in the "Roast Beef of Young America;" for the facilities for accommodating cattle here in New York have been greatly increased of late, and further enlargements of considerable magnitude are contemplated, so that, if this refrigerator system, thus far tested in a small way, continues to prove so efficacious, and its results remunerative, our enterprising stock dealers will soon begin to ship whole steamer loads of beef and pork to transatlantic markets, where beef has become scarce owing to the cattle disease.

Novel Well Boring.

In various parts of Scandinavia the boring of artesian wells is done by means of a jet of water. A description of the process is given in Dingler's *Polytechnisches Journal*. The stones, in the diluvial ground, which are a hindrance to such operations, are thrust to the one side if small; if large, they are shattered with dynamite, and the boring is thereafter proceeded with. In Kiel 22 artesian wells were thus bored during the past six months.

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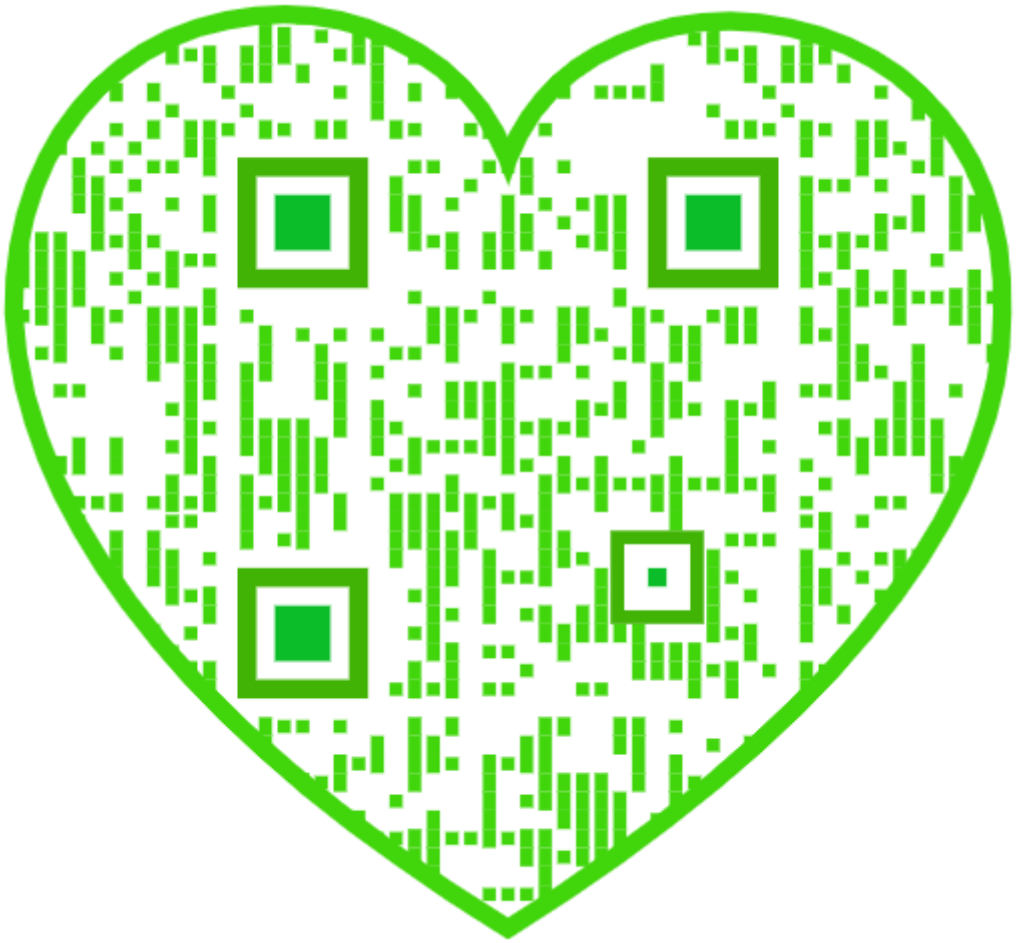

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NEW YORK, SATURDAY, FEBRUARY 19, 1876.

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The Cow.

If civilized people were ever to lapse into the worship of animals, the cow would certainly be their chief goddess. What a fountain of blessing is a cow! She is the mother of beef, the source of butter, the original cause of cheese, to say nothing of shoe horns, hair combs, and upper leather. A gentle, amiable, ever yielding creature, who has no joy in her family affairs which she does not share with man. We rob her of her children, that we may rob her of her milk, and we only care for her that the robbery may be perpetuated.—*Household Words.*

SEA LIONS.

The crowds that hang around the sea lions' enclosure at Central Park are a standing proof of popular interest in these remarkable animals. The whole houseful of land lions, tigers, and other carnivora, near by, commands a smaller audience; and even the monkeys are neglected for the yelping pack of semi-aquatic performers without. That the exclamations of the onlookers should often betray the haziest possible notion of the real character of sea lions and their place in the animal kingdom is not surprising; even professed naturalists admit a plentiful lack of knowledge with regard to them, as their natural history has been studied, for the most part, only in a limited and fragmentary way, scarcely a single species having been fully investigated. Millions have been slaughtered for their skins, but those engaged in the murderous traffic care nothing for the scientific interests of their victims. Naturalists of exploring expeditions have made isolated observations and brought home a few skins and skeletons. But for connected and expended studies of these commercially valuable and scientifically interesting creatures, we are indebted mainly to the report of Mr. Elliott, who was sent out by our government to investigate the sealing and other resources of our lately purchased islands in the North Pacific, and to the observations of Captain Musgrave, who beguiled the tedium of a twenty months' enforced sojourn on the Auckland Isles by watching the species inhabiting that region.

Visitors at Central Park have the privilege of seeing the largest collection of sea lions ever brought together in a museum. The Zoölogical Society of London, which leads Europe in this department, has had only three live ones, and now has two, the first one (also the first ever seen alive in Europe) having died some years ago. Nor are European museums much better provided with dead specimens. But thanks to the exceeding popularity of "seal" fur, a lively interest has been aroused in regard to the animals which furnish it: an interest which, a recent English writer hopes, will be fruitful in putting a stop to the hideous and needless barbarities which threaten the speedy extinction of this valuable class of sea animals: or at least, if they must submit to immutable laws—immutable lawlessness, rather—and be gathered to the dodo, the solitaire, and the northern manitee of two centuries ago, we may at least be able to point to ample remains in museums, and accurate drawings and descriptions in scientific and popular treatises.

According to the naturalist just referred to, Mr. John Willis Clarke, there are nine well authenticated species of sea lions, thus distributed: in the North Pacific three, *ottaria ursina, o. Gillespii,* and *o. Stelleri;* in the South Pacific, around Cape Horn, and in the South Atlantic as far north as Rio de la Plata, two species, *o. jubata* and *o. Falklandica*; around the Cape of Good Hope and the adjacent islands, one, *o. pucilla* or *antarctica*; around Australia and New Zealand, two, *o. Hookeri* and *o. labata*; and around Kerguelen's Land, one, *o. gazella.*

Curiously, sea lions are unknown in the Atlantic except in the extreme south, though the Atlantic abounds in true seals, from which the sea lions differ in several particulars. The more obvious difference is the possession of external ears, which seals lack. They have besides a long, mobile, flexible neck, whereas in seals the neck is short and scarcely perceptible. Then their limbs are still available for locomotion on land, while those of seals have lost all power of supporting the body out of water. Lastly, they possess the fatal gift of under fur, which gives them their commercial importance, and threatens to cause their untimely extermination.

Just now popular interest in sea lions centers in the species of the North Pacific. From time immemorial two species (*o. stelleri* and *o. Gillespii*) have inhabited an island in San Francisco harbor. Protected by the civic authorities, they have multiplied enormously, threatening the entire destruction of the salmon once so plentiful in all Californian rivers. The fish commissioners demand a reduction of their numbers, urging that the loss of salmon is too heavy a price to pay for the entertainment of the pleasure seekers of San Francisco. The latter deny the guilt of the city's *protégés,* and charge the obnoxious Chinaman with the destruction of the fish. It is pleasure and prejudice against reason and economy: which will win, it is hard to say.

The second claim of the North Pacific sea lions to public interest arises from the circumstance that eighty per cent of the seal fur now supplied to the markets of the world comes from the islands of Behring's Sea, and the indications are that in a few years our Alaskan possessions will be the only source of this beautiful fur. Everywhere else the slaughter goes on without regard to system, age, or sex, and already many islands which used to furnish thousands of skins every year have been entirely depopulated. Not less than a million skins were taken from the island of Masafuera, off the coast of Chili. In two years four hundred thousand skins were taken from a small island near Australia. From the South Shetland islands, three hundred and twenty thousand were taken in 1820 and 1821, males and females being slaughtered indiscriminately, and the young left to die. It is hardly necessary to add that, in a few years, this horrid and wasteful process wrought its own destruction.

The resorts of the sea lions of the north were discovered in 1786, and a Russian fur company was at once established. For thirty years from eighty to ninety thousand skins a year were brought away, the killing being done without regard to sex or system. About 1817 it was observed that the animals had diminished in numbers. For twenty years more the wasteful slaughter went on, until but a tithe of the original number appeared. Then the slaughter was regulated, the number of skins restricted, and the females left undisturbed. When the islands came into the possession of the United States, the system was substantially continued, with the result of giving them almost a monopoly of the entire seal fur trade. According to Mr. Elliott's calculation, as many as three million breeding seals annually congregate on the two islands, St. Paul and St. George, to which they resort; the yearlings and males under six years of age he sets down at two millions, making a population of upwards of five millions. Only young males are allowed to be killed, and the number is limited to one hundred thousand. Females are not allowed to be molested, and no killing is permitted within several miles of the "rookeries," as the resting places of the females and their cubs are called.

When the time for killing arrives, usually in June, the killers select some "hauling ground" of the young males—for the old bulls do not allow them to associate with the females—and, armed with clubs, get between them and the sea. The animals, startled by the sight of them and frightened by their shouts, scramble rapidly landwards, and are leisurely driven to the killing grounds. In favorable weather they can travel at the rate of half a mile an hour, the most effective implement for driving being an umbrella. At the killing ground they are allowed to rest awhile, after which the fittest are selected and killed with clubs, a single blow on the head being sufficient for each. The rest are allowed to return to the sea. The skins are shipped in salt.

For many years the stiff coarse hair, which conceals the under fur, was plucked out by hand. It was finally discovered that the roots of the hair were more deeply seated than those of the fur, and that, by shaving the skin from the underside until the hair roots were cut away, the hair could easily be brushed away, leaving the under fur intact, thus greatly simplifying and cheapening the work of preparing the skins. Naturally, the fur is curly and of a light brown color; but as the ladies prefer a darker shade, the fur is dyed, in which process the curls untwist and the fur becomes smooth. The government rents the islands for $50,000 dollars a year, and imposes a revenue tax of two dollars on each skin taken. According to late accounts, the population of the islands is steadily increasing, and it is proposed that the number allowed to be killed might safely be increased also. In view of the probable early extermination of the fur-bearing seals, so called, of other regions, however—at least, so great a reduction of their numbers as to make the taking of them unprofitable—it is to be hoped that no risks will be run in the only place where they have any chance of perpetuation. Better under kill than over kill, even if the demands of the ladies should be scantily gratified. Properly managed, our Alaskan islands will remain for ever a source, perhaps the only source, of this beautiful and valuable fur. Overhunted, or left to the shortsighted selfishness of professional sealers, there is danger that it may soon be said of them, as an Australian naturalist has said of another once productive region—"I should as soon expect to meet a sea lion on London bridge, as on any one of the islands in Bass's Strait!"

PROGRESS OF THE PATENT OFFICE.

Sixteen thousand two hundred and eighty-eight patents for new inventions were issued last year, ending December 31, 1875. This is by far the largest number ever granted in one year, and is indicative of a growing spirit of liberality on the part of the Patent Office people towards the inventors of our country, which we hope will not only be maintained but increased in the future.

Last year we had occasion to call public attention to the extraordinary number of applications not granted, the figures for the year 1874 showing 21,602 applications made, and only 13,599 patents issued, leaving *eight thousand* applications for patents either rejected or undecided. We then stated in effect that in view of the statistics for 1874, the Patent Office examiners appeared to consider it to be their highest function to prevent the issue of patents; but we showed that, in accordance with the spirit of the Constitution, it was their paramount duty to seek reasons for the encouragement of inventors *by the grant of patents.* It is gratifying to observe that the Hon. Mr. Duell, new Commissioner of Patents, has adopted the latter view, and has sought to reduce the action of his subordinates to the same liberal line of policy. It will be observed by a glance at the Commissioner's tabular statement, on page 120, that, although the number of applications made for patents during the year 1874 and 1875 is about the same, the number of patents issued in 1875 is greater, by more than two thousand six hundred, than the issues of 1874. There is room for further improvement, and we trust that the Commissioner will continue to insist upon the observance of a prompt, liberal, generous treatment of applicants for patents until all complaints in respect to rejections shall practically cease. The patent law makes it the duty of the Patent Office promptly to issue a patent to every applicant, no matter how small the invention, provided it contains a grain of novelty and utility. All questions of infringement are left for settlement by the courts; the Patent Office has nothing to do with them.

But there is one serious, fruitful source of trouble, continually going on at the Patent Office, which consumes much valuable time of officers, and occasions great expense and dissatisfaction to applicants. We allude to the litigation pertaining to Interference cases. We are inclined to believe that these cases should be removed from the Patent Office and settled by the Courts. We should be glad if something practical in this respect could be enacted by Congress.

A NEW ENGLISH RIVAL OF AMERICAN PETROLEUM.

A new process of utilizing the gas of shale oil works has recently been devised in England, which, if we may trust the statements of the London *Grocer,* is to bring better times to the British manufacturers of mineral oil, who now

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are unable to make much headway against the large petroleum exports from the United States. An immense quantity of such gas is wasted in the production of paraffin. Every tun of carbonaceous shale destructively distilled yields from 2,500 to 3,000 feet of the gas, in addition to other products, and our contemporary places the amount of shale thus treated in England and Scotland at 600,000 tuns.

In some large works, this gas is directly collected and used for illuminating purposes in the vicinity; and at one time it was proposed to illuminate the city of Edinburgh by conveying the vapor from the Addiewell Works near by. The new invention, it is now said, provides a way of bottling this gas —that is, converting it into a highly volatile liquid, a gasoline, which may be found a staple and valuable article of commerce. The inventor is Mr. J. J. Coleman, F. C. S., and his machine is based on the well known principle used in such ice-making apparatus as that of Windhausen and Mignot, namely, that air, when compressed and then allowed to expand, produces cold, especially when, in the act of expanding, it is made to perform work, such as driving a piston in a cylinder. The shale gas, it appears, is first compressed; then, after removing from the machine the collected liquid, the inventor causes the compressed gas to work an engine which delivers the exhaust gas at a temperature below the freezing point. The most ingenious feature of the invention is that the power which is first employed in compressing the gas is in great part recovered by the expansion of the gas in the act of producing cold: and owing to this result, when the machine is in full action, the steam may be, in a great measure, turned off. The gas thus works as it were in a circle; but of course it is constantly diminishing in quantity, and at the same time the loss is being made up from the condensers, which, in their turn, are attached to the retorts.

Very brilliant illumination has lately been obtained in Paris by saturating coal gas with gasoline and then burning it with oxygen. With Mr. Coleman's liquid, it is believed, a similar saturation can easily be effected; and Messrs. Laidlaw & Sons, of Glasgow, well known gas engineers, have undertaken the manufacture of the necessary machinery for treating a quarter of a million cubic feet of gas per day as an extended experiment. It is believed that about 2,000 gallons of the gasoline may be weekly obtained from this plant. Some of the material yielded will probably be naphtha; but the average specific gravity, it is stated, will range about 0·684. It is expected that there will be a large demand for the product at one shilling sterling (24 cents) per gallon.

KENTUCKY WEATHER PROPHETS.

The weather prophet of Kentucky farmers, according to the Louisville *Commercial*, is the breast bone of a goose, a yearling goose; and on the strength of the prognostications of such a bone, that paper predicts that the coldest weather of the present season will come after the middle of February.

The *rationale* of the augury is extremely simple. The breast bone of a young goose is translucent, with cloud-like spots in places, which white spots denote cold weather. It is to be inferred that all the geese of any year have precisely the same cloudings on their breast bones, though this important circumstance is not specially noted. Nor is any information given with regard to the geographical area covered by the goose-bone prediction in any case. We beg the *Commercial* to investigate this matter more thoroughly, for the benefit of the Congressional economists who want to abolish the Signal Service Bureau and all the sinecures incident thereto. Probably the family in Woodford county—who have so carefully preserved the little prophets for fifty years, and declare that not one of them has been wrong in its predictions—would be able to clear up all doubts and difficulties on this score, and demonstrate the utter wastefulness of telegraphic "probabilities" when prophetic certainties are so easily procurable.

In this connection we may properly mention the proposition of another Kentucky gentleman, who has been telling the Cincinnati Christian Association how to impose a wintry climate on the poor naked denizens of the South Sea Islands, and transfer their balmy climate to our own shores. For a man rejoicing in the title Reverend, and a company styling themselves Christian, this project, we may be permitted to say, is about the coolest we have ever heard of. But it is the scientific, not the moral, aspect of the proposition that we have to do with here.

At first thought, no undertaking would seem to be of more difficult accomplishment than the shifting of the climate of any hemisphere, massing all the cold in one part and all the warmth in another; but our reverend lecturer shows how it can be done with the utmost certainty and ease. Everybody knows that the south wind brings the warmth of sunnier climes, while the north wind brings arctic cold, provided, of course, that they blow long enough and far enough upon the earth's surface. And nothing is simpler than to suppose that if a south wind could be kept constantly blowing over our country, we should enjoy a summer temperature all winter. To most meteorologists the *if* in the case is a portentously large one, but not to the Rev. L. B. Woolfolk, of Lexington, Kentucky. He knows that the south wind is always on the surface of the earth, except during storms, and even then the north wind never has but one track at once. Consequently if we make a track for the north wind and keep it there, we shall have, everywhere else, a prevailing south wind and a genial climate. It is just as clear as that two and two make twenty-two. Now storms are always the result of a conflict between north wind and south wind. It is well known that heavy cannonading always raises a storm by breaking a path for the north wind. Therefore keep up a deuce of a racket where you want the north wind to blow, and you'll certainly have the balmiest of south winds for ever blowing right and left.

The learned lecturer proposes—and very wisely, seeing that the South Sea islanders are not able to resent the imposition—proposes, we repeat, to make the Pacific Ocean the track of the boreal winds, by a perpetual *feu de joie* on the Aleutian Islands. We are told by the Cincinnati *Gazette* that he was eloquent in depicting the results of such an easy and beautiful re-adjustment of the winds. The deserts of Asia and America would be visited with seasonable rains; warm weather would blow up the Atlantic (not like dynamite, we trust) into the Arctic Ocean, bearing before it tropical waters, until the arctic coasts, swept with tropical winds, would become habitable; and the arctic seas, flooded with tropical air and tropical water, would become the highway of commerce, and vessels would sail through open water at the pole, and every goose bone would become immaculately translucent, except in the South Sea islands; and as the people there do not keep geese, the change would signify nothing to them.

A word of admonition here. This is the Centennial year. We know how it began, and can faintly estimate what terrific reverberations will arise from time to time toward the culminating day of the year. Now that Mr. Woolfolk has spoken, we know what a terrible succession of arctic waves we are liable to bring down upon ourselves, blasting our crops and making the derided Ulster a Centennial necessity, while the shiftless Sandwich Islanders and the rest will bask in endless south winds, needing not so much as a pocket handkerchief for protection from the weather. With the earnestness of conviction, we say: Don't! For heaven's sake, keep still. If the yelling must be done and the powder burnt, let them be transported to the Aleutian Islands and discharged there. It will be hard for the Aleuts; but they are few and feeble, and know nothing of Centennial joys and fears. And as for the people south of them, let them —no: that involves a question of morals which is without our sphere.

OPIUM DANGERS.

It is a curiously suggestive fact that very few of the weekly journals, especially of literary nature, which go directly into families, can nowadays be examined but that somewhere in their advertising columns are found announcements offering radical cures for the opium habit. We have found these advertisements abundant in fashion magazines; and indeed so widely spread are they, and so persistently are they kept before the public, that a stranger might seriously ask himself whether the mania for the drug be not as strong in this civilized country as in China. Two or three cases, of those who have become addicted to the use of opium through its employment as a medicine during acute illness, have lately been brought to our knowledge; and some further inquiry leads us to believe that the large majority of opium eaters thus acquire their baneful taste. Dr. J. B. Mattison, in an article in the *Medical Record*, strongly advocates this view, and re-inforces his conclusions with a timely caution to physicians regarding the careless prescribing of the drug. It appears that, while alcoholic intoxication is decreasing throughout the United States, opium drunkenness is increasing, and the dealers in crude opium and the manufacturers of its alkaloids assert that the importation of the one and the productions of the other are rising rapidly year by year: so much so regarding morphia, that at one of our largest manufacturing centers the supply is said to be insufficient for the demand.

Dr. Mattison adduces a most interesting array of instances in proof of his views. Cases are mentioned of persons (who previously took opium to gain relief from the pain of sciatica, or neuralgia, or similar acute maladies) becoming confirmed inebriates, utterly unable to disenthral themselves, and swallowing their daily potion not as a means of gratification but as a physical necessity. Legislative enactments prohibiting the refilling of an opiate prescription, or the dispensing of opium in any form, unless in pursuance of a prescription from the attending physician, would, Dr. Mattison considers accomplish an immense amount of good. It would not wholly check the vice, but would greatly mitigate the same. "In carrying out the reform," he adds, "it should be the aim of every practitioner, when called upon to prescribe this most valuable medicine, to see to it that he exercises a discriminating care in so doing, by careful inquiry as to the neurotic status of his patient from the standpoint of hereditary tendency, and, if necessity demands a somewhat prolonged administration, to watch most warily and guard most strenuously against the earliest indications of an appetite that, thoroughly established, will scarcely be denied, and which entails upon its unhappy possessor a darkness so dense, a horror so indescribable, that death, at times, seems preferable."

THE ARISTOCRACY OF ALL.

"Yes"—we hear it said, even in this Centennial year of the Republic—"the theory of democracy is well enough; but after all the real progress is the result of class distinctions and privileges. Culture implies spare time and abundant means: in other words, an aristocracy of some sort, which must be supported by the labors of others. Only by the exemption of some from the drudgery of self-support is it possible for civilization to exist, much less to advance."

The assumption—it cannot be called an argument—is plausible, but it will not bear examination. However much the civilization of the past may have rested upon systems of privileged classes, the civilization of today rests upon and is carried forward by the working masses: not slavish toilers, kept down by class restrictions as of old, but freemen, who use their brains as well as their hands, and know that all things are possible to intelligence and thrift. It is by those who personally earn the right to leisure time, very frequently in the process of earning it, that the great steps of human progress are taken. As Higginson cleverly remarks, history is not written by the privileges of the rich, nor, we would add, by the privileges of the high born, but by the progress of the many. "Privilege traveled in its carriage with all clumsiness twenty miles a day; but when the people wished to go, steeds swifter than the wind were harnessed, and long lines of steel stretched far away that they may go in speed and safety. Privilege could only send its messages by fires on hilltops, and thus communicate slowly joy or grief; but for the messages of the people, the flames were condensed in one spark, and sent across continents and under oceans. Everywhere we find the failure of privilege the success of the whole. An aristocracy of all I want, where the humblest child may come from his cradle into a grand and glorious career."

This is the ideal that was aimed at by those whose actions we commemorate in this Centennial year. Its practical achievement may be celebrated a hundred years from now. The aristocracy of birth—hereditary rank, we mean, not inherited virtue, intelligence, and personal power—is done with. Its place has been usurped by what Higginson styles the aristocracy of the dollar. In the struggle for position, wealth leads, for it has the advantage of power.

To acquire wealth requires in the main the possession of force, albeit rude and pushing. To keep wealth requires, even more imperatively, personal ability. "So the aristocracy of the dollar is as foam on the waves of progress, bright, evanescent, changeable as the wave itself. It represents actual power, not past possessions like hereditary aristocracy."

But ability to hold is not a common inheritance. Nature is averse to hereditary rank, and titled families soon run out unless sustained by plebeian blood; and still more heavily weighted in the race for life is hereditary wealth. The aristocracy of birth is of the past. The aristocracy of wealth rules to-day. But it too is doomed. There is but one stable aristocracy possible, and that is the aristocracy of all, based on common freedom, common virtue, universal intelligence, and universal labor. The doers shall inherit the earth.

IMPROVEMENTS IN THE ORGAN.

In another portion of this issue will be found an illustrated description of some new and remarkably ingenious applications of electricity to organs, by means of which an instrument in one part of a hall is played from a keyboard located in another and distant portion. The invention is one which easily suggests the possibility of the distance between the keyboard and organ being increased, and thus, perhaps, may be a precursor of those possible electric devices to which we have, in the past, alluded, and by which we may be able to lay music in every house in New York city with as little difficulty as now is found in putting in the gas.

While this idea may be called an advantage of electric music yet to be realized, the immediate value of the use of electricity in the instrument rests on a different basis. That value is the vastly increased facility in handling the keys offered to the player. There is a large church organ now in this city in which a force of 5 lbs. is required to push down each key. It is easy to calculate the amount of power which the organist must actually develop to play at all. For instance, in the well known air o "Old Hundred" there are 34 notes. Supposing each note to represent a chord to be played by each hand, and each chord to average three notes, there are 204 notes to be pushed down a distance of, say, $\frac{1}{4}$ inch each for every verse or repitition of the tune. The time occupied in singing the air is slightly over 1 minute. Therefore 5 x 204 or 1,020 lbs. are moved through a space of $\frac{1}{4}$ inch in the above period by the fingers and elbows alone, equal to about 21$\frac{1}{2}$ lbs. raised 1 foot high in a minute, or $\frac{1}{1500}$ horse power, approximately. The labor an organist has to perform in carrying through a long mass or choral service is considerable. With the electrical organ this labor is entirely obviated; the touch is lighter than that of a pianoforte.

The builder of this new organ has succeeded in reproducing the *timbre* and quality of the human voice by machinery in a manner which is certainly wonderful. The echo organ is located in the garret, at a point where three angles of the roof meet, and the sound issuing from the open top of its case is reflected down upon the ceiling. The effect is such that every sound heard in the auditorium, though faint, is perfectly clear. By drawing the *vox humana* stop—a close copy of the similar arrangement in the celebrated Freiburg organ—and also the *tremolo*, the performer is enabled to produce not merely a sound of the quality of the voice, but also one having the voice's natural defect—the *vibrato* or shakiness of tone. Under the circumstance of the illusion, aided by the fact that the sound comes from an opposite quarter to that in which the performer is located, it is exceedingly difficult to convince one's senses that they are deceived. The effect is substantially that of an actual choir. The famous talking machine which was exhibited in this country several years ago, by means of rubber vocal arrangements, articulated words with great clearness, infinitely better, in fact, than the average vocalist in singing. The difficulty was, however, the dismal monotone, and this the genius of the inventor could not overcome. We therefore suggest a combination of the talking machine and organ; both are played from key boards, and therefore the machine could be arranged to connect with the organ manual by a simple stop. Send the tones of the *vox humana* echo through the mechanical larynx, and there is a singing machine. Perhaps the time is not far distant when a congregation will be provided with a mechanical choir.

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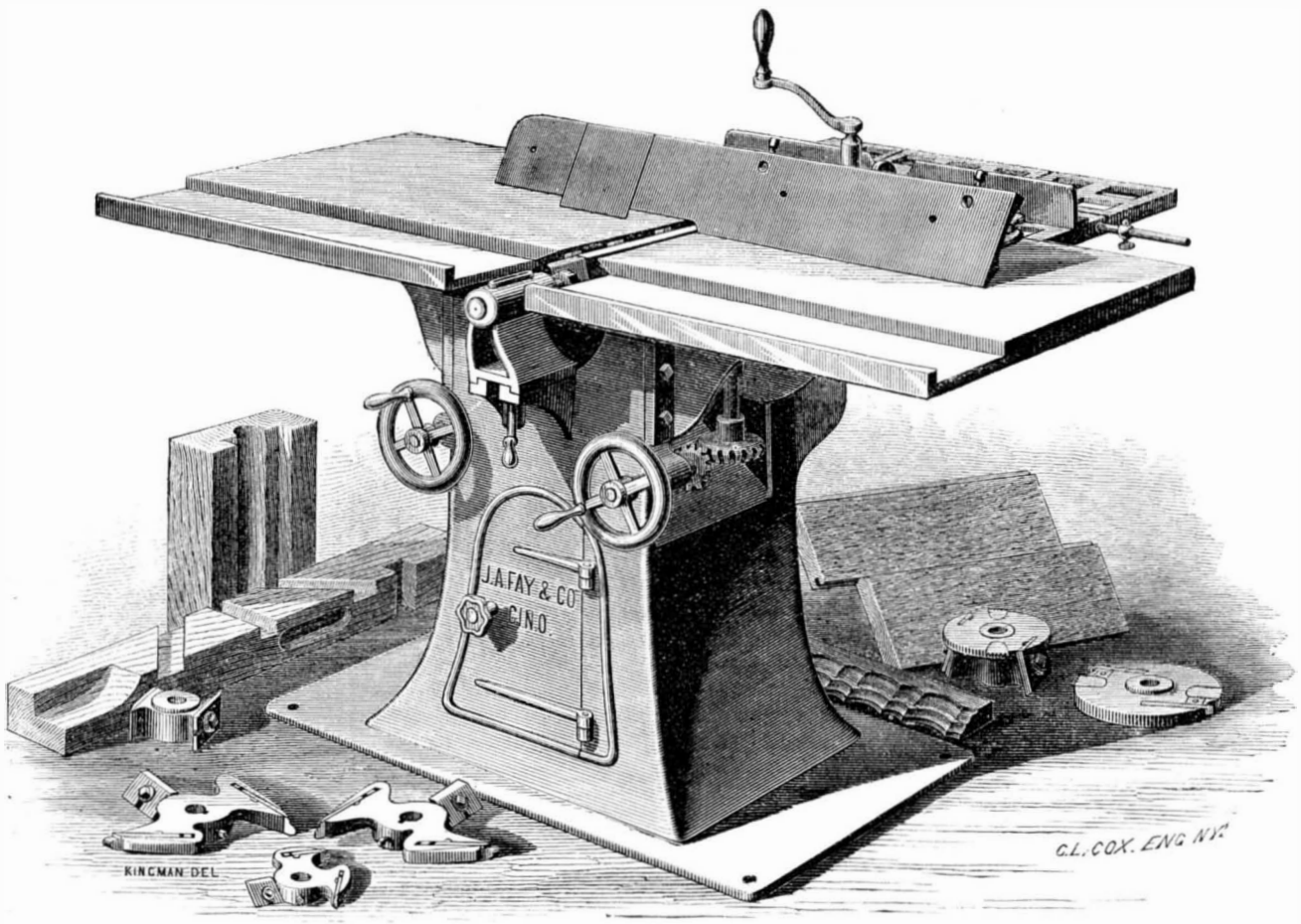
NEW WOODWORKING MACHINERY.

In the manufacture of doors, sash, furniture, and patterns, as well as in agricultural implement, wagon, and carriage shops, etc., a large number of different operations, performed upon the same material, require separate machines, which occupy much space and consume much capital.

The present invention, recently introduced by Messrs. J. A. Fay & Co., Cincinnati, Ohio, is an apparatus which combines the capabilities of several such machines, while embracing the essentials of convenience of adjustment, ease of operation, and rapid production. It is adapted for planing out of wind, making glue joints, surfacing straight, tapering, and beveling work, rabbeting, gaining, grooving, plowing, working circular moldings, panel raising, squaring up bedposts, balusters, and newels, ripping, cross-cutting, etc., the only practical limit being the capacity of the operator for methods of manipulation. It is constructed on a strong substantial column of convenient hight, and can be belted either from above or below; and the iron tables are supported on the column in planed gibbed ways. These tables have vertical adjustment by means of hand wheels and bevel gears, for regulating the depth of the cut, and lateral adjustment to make a larger or smaller opening between the tables, according to the size of the head or cutter being used. The tables have an arrangement by which the distance from the periphery of the cutter is maintained as they are raised or lowered. They are also arranged for receiving the slides of the gaining frame and other attachments, and for making a continuous table for sawing.



J. A FAY & CO'S. No. 3 VARIETY WOOD WORKER.

The bearings of the arbor are supported on the column, one of them being cast solidly to it, while the other is movable, being planed in a seat, the hight of which, to the center of the arbor, is equal to one half the diameter of the largest head to be used. This movable bearing is held in place by a bolt which has a handle for convenience in loosening it, giving great facility in removing and replacing the different heads required for different kinds of work. The outside movable bearing is a very important feature in the machine, giving greater stability to the arbor, and obviating its liability to spring when dependent only on inside bearings, and thus rendering the machine capable of performing a heavier range of work.

The adjustable fence and bevel rest is fixed to and moves with the forward table, has adjustment for angles to 45°, and is arranged to receive stud springs, for holding down lumber, and the panel raising attachments.

When desired a boring and routing table is affixed to the rear end of the column, and this table has all necessary adjustments, gages, etc., to adapt it to a full line of that class of work. The belt for driving the machine is put on at such an angle as to leave the table level clear of obstruction.

This machine is the result of long experience in this line, assisted by practical tests, and is secured by letters patent. At the last Cincinnati Industrial Exposition, it attracted attention for its novelty, superior character, and variety of the work produced.

We have on our table a piece of hard wood about 14 inches long and 2½ inches wide, showing some eight or nine different kinds of work, all performed on this one machine, embracing planing out of wind, squaring up, rabbeting, cornering, chamfering, straight and angular gaining, beading, routing, boring, etc. This sample of work is in itself quite a curiosity. Two sizes of the machines are made, regarding which further information may be obtained by addressing the manufacturers.

The Telegraphic Value of Language.

A larger number and greater variety of ideas can be conveyed, with more exactness, in a given number of words in the English language than in almost any other. This is strikingly shown in the matter of telegraphy. It has been demonstrated that, for all telegraphic purposes, the English language is from 25 to 33 per cent cheaper than the French, German, or any other language.

A Safe Lamp Burner.

J. H. P. says: "Many lamp burners for use without chimneys have been invented, but none that I have seen is safe. The chief defect of all such burners is the shortness of the tube. There being no chimney to create a draft, so as to carry off the heat, the atter is conducted down the tube and the surrounding brass network to the top of the lamp, thereby heating the oil and causing it to take fire or to explode.

"The tube of a no-chimney burner should be not less than 4 inches long, instead of 1½ inches, the ordinary length; and the fixture which surrounds the flame should be so made as to leave the cap exposed, so that any cinders or fragments of the wick falling down may be seen and removed. These cinders, falling upon the cap of the lamp, become saturated with oil, and frequently take fire and burn unseen, till the oil is heated to the flashing point, and the lamp is filled with explosive vapor. I have constructed a burner for my own use, which I regard as free from danger. The tube is 4 or 5 inches in length; and the fixture which regulates the flame is attached to the upper end of the tube, and has no connection with the cap, but is 3 inches above it. When in use, the lower end of the tube is nearly as cold as any part of the lamp. It is to be hoped that the numerous inventors of burners will furnish us something of this kind, which we can use without fear of losing our lives."

AUTOMATIC SPRINKLER FOR EXTINGUISHING FIRES.

Mr. Hezekiah Conant, of Pawtucket, R. I., has lately (November 2, 1875) patented an improved fire extinguisher, which consists in a sprinkling pipe to which water is admitted as soon as a tightly stretched skein of cotton or other fibrous material is touched by the flame.

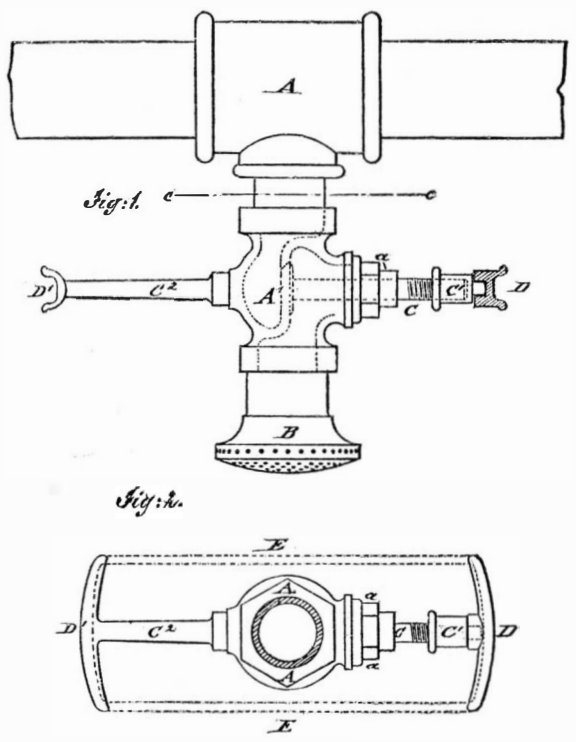


Fig. 1 represents a side elevation of the apparatus, and Fig. 2 a bottom view of the same. A represents the water supply pipe at the top or ceiling, which is provided, at suitable points and distances, with downwardly extending discharge pipes, A', according to the dimensions of the rooms. Each pipe, A', is provided with a suitable valve, whose stem, C, is extended in horizontal direction, and guided in a tightly sealing side bearing, *a*, of the discharge pipe. The lower part of the discharge pipe is arranged with a sprinkler, B, that distributes the water in different directions. The outer end of the horizontally sliding valve stem is provided with a slightly curved and grooved T bearing, D, over which and a similar bearing, D', in diametrically opposite direction from the former, a skein, E, of cotton is wound, of such thickness that the valve is firmly retained on its seat. The bearing or support, D', is applied to a stationary arm, C^2, of discharge pipe, A', and the cotton or other suitable inflammatory material stretched tightly on the supports by means of a screw sleeve, C^1, that turns on a thread of the valve stem, and in a socket recess of bearing, D, so as to act on the same and secure the perfect closing of the valve. As soon as the flames reach the valve-holding cotton skein, so as to burn the same, the valve is forced open by the pressure of the water thereon, and the water is discharged in all directions on the fire. The sprinkler may be tested at any moment by simply cutting the cotton skein, and instantly be readjusted by winding a new skein around the bearing, and adjusting the stretching screw nut.

A Grand Zoological Laboratory.

A magnificent zoölogical laboratory is to be founded in Naples, Italy, under the control of M. Dohru. It will consist principally of a large general aquarium, in which will be collected all the marine *fauna* peculiar to European waters, together with eighteen special aquaria for the preservation of specimens under natural conditions, for the convenience of those who may be prosecuting original investigations into the habits of the fish. A large library and anatomical collection will be added, and provision will be made for a number of separate private laboratories, to be rented to universities or to governments. The subscription price is $360 a year. Italy and Russia have each secured two places, Saxony one, and the Universities of Cambridge and Oxford each one. Other applications are rapidly being received, and it is believed that eventually the institution will be one of the largest and finest of its class in the world.

The Population of India.

Here are the results of the first census of the population of India, taken from the English documents, compiled by *L'Union Médicale*. India, with the vassal states of England and all their dependants, contains 238,830,958 souls, which is equal to the entire population of Europe. To every square English mile, there are, on an average, 211 persons. The largest city is Calcutta, and it possesses a population of 895,000 inhabitants. Bombay has 644,000; Madras, 398,000; Lucknow, 285,000. Their religious, in round numbers, amount to 140,500,000 Hindoos; 40,750,000 Mahomedans; 9,500,000 Buddhusts, Jews, and Parsees; the Christians amount to 900,000, of which 250,000 are European, the other 650,000 are native. There are 23 different languages spoken in India; in the Western Provinces there are 300 different castes; in Bengal about 1,000 exist. There are employed by government 1,236,000 persons (the natives included); 629,000 (of which 819 are missionaries) are supported by religion; there are 30,000 religious medicants; 10,000 astrologers; 5 sorcerers; 465 exorcists; 518 poets; 1 orator; 33,000 jurists; 75,000 physicians: 218,000 artists, among whom are acrobats, serpent charmers, and monkey showers; there are 137,000 agriculturists; 950,000 elephant and camel drivers and shepherds; 22 professional gamblers; 5 pigeon trainers; 49 spies; 361 professional thieves; 30 highway robbers; 103,000 mendicant vegabonds.

Artificial Butter in Copenhagen.

It seems that our friends in Northern Europe are not to be outdone in the butter market by the French nor ourselves; and one of them, named Diderichsen, has devised a new method of making suet butter, which differs in some of its details from that employed in this city some two years since. The suet is first washed in cold water, and cut up in fine pieces; then it is placed in wooden vessels and melted by aid of steam heat. About 1 per cent of soda, dissolved in some water, is added to the melted fat, which is cooked for a few hours. Fresh soda is added, and the boiling repeated, after which the mass is washed with boiling water and pressed through flannel. To this mass, while still warm, but not above 140° Fah., 3 per cent of olive oil is added, and 3 or 4 per cent of sour milk, and the whole is then churned.

SALT of lemon is the best material for removing stains of iron mold, but it should be used very sparingly, as any excess will destroy the fabric.

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IMPROVED TOOLS FOR THREADING BOLTS AND NUTS.

The accompanying engravings represent improved machinery and tools for bolt-cutting and nut-tapping, manufactured by the Pratt and Whitney Company, of Hartford, Conn. The series of new machines lately introduced by this firm comprehends power and hand bolt cutters, die stocks, adjustable tap wrenches, and taps, adapted to the use of jewelers, machinists, bridge builders, mill owners, steam and gas pipe fitters, manufacturers of agricultural machines, sewing machine makers, gun makers, carriage builders, and all others requiring bolt-cutting and tapping implements.

The large engraving, Fig. 1, represents what is designated as the No. 3 bolt cutter, driven by power, and having a range for bolts from $\frac{5}{16}$ of an inch to 1 inch diameter, and of nuts of corresponding sizes. The head spindle is hollow, and is furnished at the front end with a chuck for securing the bolt to be cut, or for holding a tap. The spindle is driven by a three-graded cone, the arbor of which connects with the spindle by gears. The chasers forming the dies are held in collets (Fig. 2), four in each, and secured in radial slots in the collets by screws, permitting their accurate adjustment. These collets are seated in holes for their reception on a revolving cylinder, mounted on a sliding carriage, that is moved on the ways of the bed of the machine by hand wheel, rack, and pinion, as may be seen by reference to the engraving. The cylinder holds on its periphery nine of these collets, and a plate with different sized perforated recesses for holding square and other nuts for tapping. This plate is shown as presented to the chuck. One plate may be slipped out and replaced by another, with different recesses, instantly. By removing a collet opposite the one that is at work, a bolt may be threaded to any distance desired. The cylinder containing the collets and the nut vise is instantly brought to the bolt, or the tap, by means of the hand wheel, and the cylinder is held in position on its center by a simple

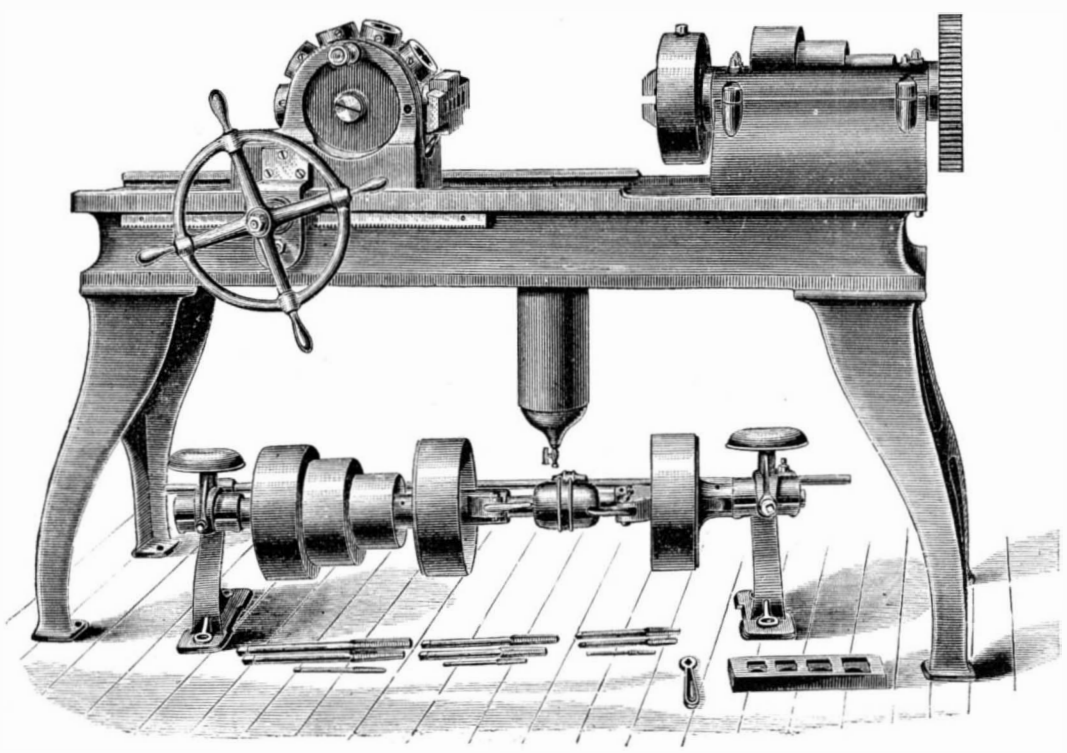
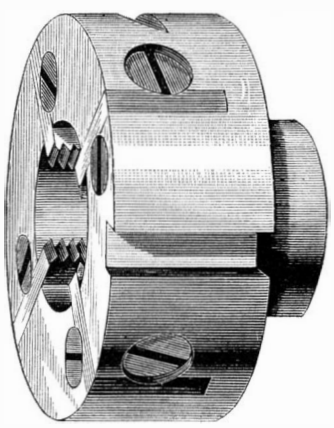


Fig. 1.—THE PRATT AND WHITNEY COMPANY'S BOLT CUTTER.

Fig. 2



spring bolt. The threading of the bolt or the tapping of the nut is completed at one operation, the die or the tap cutting a perfectly full thread (without raising or squeezing), fully equal, it is claimed, to that produced on a screw-cutting lathe. The collets may be instantly removed, and may be replaced by hollow mills for pointing the end, turning the body, or squaring under the head of the bolt; and the bolt may then be threaded without removing it from the chuck. The hollow spindle allows bolts of any length to be threaded, and the geared head and three-graded cone give great power and a sufficient range of speeds The chasers or cutters in the collets are sharpened, when dulled, simply by grinding on an ordinary grindstone; and any one of them may be duplicated, when broken, without the necessity of replacing the entire set. The machine is economical in the use of oil, as all the chips and oil are received into the hollow bed, and the oil drains through a strainer into a receiver, from which it may be drawn to be again used. The countershaft is furnished with F. A. Pratt's patent reversing clutch, which works with ease and certainty, and without jar or strain; and this, with the nut-tapping apparatus and case-hardened wrenches, is sent as a part of the machine.

A larger machine, similar in construction and operation, has a range for threading bolts from $\frac{1}{2}$ inch to $1\frac{1}{2}$ inches in diameter. This is known as the No. 4 bolt cutter. Two others are built, intended for hand work, known as No. 1 and No. 2, having respectively a range of $\frac{1}{4}$ to $\frac{3}{4}$ of an inch and $\frac{3}{8}$ to 1 inch diameters of bolts and taps. The company also build an open die machine, having a capacity of $\frac{3}{8}$ to 1 inch bolts, the dies of which are instantly opened, either by hand or automatically, to allow the bolt, when threaded, to be at once withdrawn, thus saving the time spent in running the bolt back through the die. The dies may be instantly interchanged for the different sizes of bolts without absorbing any time in adjustment.

The other engravings show a die stock, Fig. 3, with the collet, and an adjustable tap wrench, Fig. 4. The die stocks are made of five sizes, capable of cutting from $\frac{1}{16}$ to $1\frac{1}{2}$ inches diameter, and Nos. 2, 3, and 4 may be fitted with dies for threading gas pipe of all the sizes up to and including $1\frac{1}{2}$ inch pipe. These die stocks are drop-forged, in a single piece, from the toughest wrought iron, finished, and then case-hardened. The collets are held in place in the stock by spring bolts, which, when thrown back by the thumbs, permit the collet to drop out, to be replaced by another for a different size of bolt. The chasers, as may be seen by reference to the engraving, are seated in radial recesses in the collets, and are held and adjusted by screws.

The tap wrench, Fig. 3, is also drop forged, of the best iron, finished, and carefully case-hardened. It is made of four sizes, to fit the shanks of taps up to $1\frac{1}{8}$ inches. There are two jaws seated in the body of the wrench, which are opened and closed by the thumb moving a cam disk, and held in position by a spring pawl. They hold the tap securely, preventing the danger of cramping and breaking the tap in using.

The threads of the taps and dies are cut to the United States standard, as promulgated by the Frankl inInstitute; but the Whitworth thread, or special sizes, will be furnished as may be ordered. The taps are threaded and fluted before being relieved, the only way, it is claimed, in which they can be, with certainty, finished accurately to gage. In replacing one tap for another, or in duplicating a chaser, a perfect *facsimile* is assured, as the gages by which each piece is finished are themselves duplicated, one set being kept on hand, to be used only for verifying the accuracy of the working gage. The manufacturers have the reputation of using the best quality of steel in the taps and chasers, which are hardened and tempered in the most careful manner. Every piece is thoroughly inspected, and none with visible imperfections are allowed to leave the works. The workmanship on these tools, the company affirm, is of the best, and they intend to insure entire accuracy in the sizes of the taps and dies, and the grades of the threads; so that the purchaser may be certain of obtaining these tools, at all times, of the best material and workmanship, and without variation from standard sizes.

The pipe taps are constructed on the same principle as the dies—that of interchangeability—the cutting portions being inserted in longitudinal slots on the body of the tap, so that any one of the slips, or cutters, may be removed, if injured, and replaced by a duplicate, fitting in its proper and relative place, thus avoiding the rejection of the entire tap, and saving unnecessary expense.

These tools are manufactured under letters patent issued to J. J. Grant, assignor to the Pratt and Whitney Company, Hartford, Conn., who may be addressed for further information.

Fig. 3.

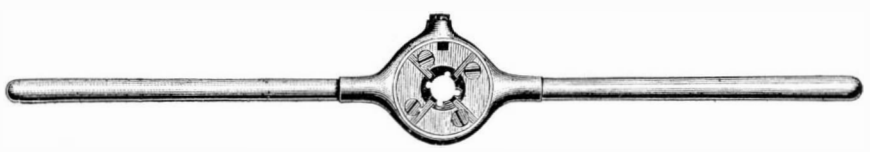


Fig. 4.

THE PRATT AND WHITNEY COMPANY'S DIE STOCK AND TAP WRENCH.

The Spontaneous Combustion of Coal.

The *Revue Industrielle* says that, out of all the ships laden with cargoes of coal exceeding 500 tuns, which sailed from England for regions south of the equator during the first nine months of 1873, and during the similar period in 1874, 23 were destroyed by spontaneous combustion of the coal in the first year, and 50 in the second. These figures indicate 2 per cent of all the vessels in one case and 4 per cent in the other. It appears that the casualties are not imputable to any one class of coal, but to all classes without distinction.

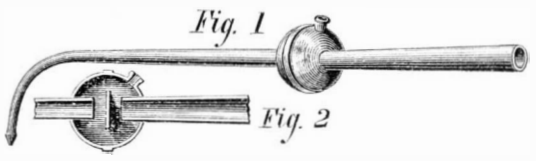
The theory which attributes spontaneous combustion to the presence of pyrites in the coal may explain, up to a certain limit, the increasing number of accidents; because, before the augmented demand of late years existed, it was customary to free the coal more carefully from this impurity than is at present done. On the other hand, Richter has shown that, for various coals experimented upon, those which contained the most pyrites were not the most exposed to spontaneous combustion. According to him, air is rapidly absorbed by the coal, and the oxygen of the air then combines with the organic components to produce carbonic acid, with a development of heat. According to all probabilities, however, the heat which determined the spontaneous combustion is due both to the oxidation of the iron and to that of the carbonized matters. This, confined in badly ventilated holds, speedily reaches a temperature sufficiently high to produce combustion.

An International Coinage.

Senator Sherman, of Ohio, recently presented to the Senate a resolution proposing a common unit of money for the United States and Great Britain and Ireland. The proposition is to make the gold dollar the common unit, slightly reducing the value of the dollar so that five dollars shall equal the British pound. It was referred to the committee on finance.

A NEW BLOWPIPE.

Mr. Charles Rumley, of Helena, Montana Territory, has lately patented (November 23, 1875) a novel form of blowpipe, engravings of which are herewith given. The idea is to afford an easy means of expelling the moisture which collects on instruments of this description, when supplied with air from the mouth; and to this end, the pipe is divided, and the two portions enter a hollow globe, as shown in section



in Fig. 2. In this globe is a central strip or diaphragm plate, against which the entering air impinges and which arrests the moisture and prevents its being carried along into the outer portion of the pipe. The globe has also a small exit opening, which, when the blowpipe is in use, is closed by a plug. In order to remove the condensed moisture, it is merely necessary to remove the plug, and turn the globe so that the opening comes beneath. Blowing into the mouthpiece then drives out the water. This device, which is shown complete in Fig. 1, offers a simple means of keeping blowpipes clean without detaching any removable parts.

Bicarbonate of Soda a Toothache Remedy.

Dr. Duckworth, of St. Bartholomew's Hospital, London, has recently successfully used bicarbonate of soda as a remedy for severe toothache, when applications of chloroform, either externally to the cheek or to the ear, o, placed on cotton in the decayed tooth, failed; and when carbolic acid, applied as last mentioned, also proved inoperative. Pledgets of cotton, soaked in a solution of 30 grains of bicarbonate of soda in one fluid ounce of water gave almost instant relief. Dr. Duckworth considers that very frequently the pain is due to the contact of acid saliva with the decayed tooth; and therefore it is important, in cases of odontalgia, first to determine whether the saliva has an acid reaction. If this be the case, then a simple alkaline application, as above stated, is the most efficacious means of cure.

Cases of toothache are such common accompaniments to disordered stomach that there seems every reason for the truth of the above author's conjecture. Doubtless on the same ground is due the efficacy of ammonia, so frequently recommended, but which, if applied carelessly, is liable to produce more pain by burning the gum than already exists in the tooth.

Bicarbonate of soda is found in every kitchen, and hence no more handy remedy could be devised, while it is destitute of any painful effects; and the *rationale* of its operation and its simplicity make us wonder why it has not been thought of before

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Correspondence.

The "Etheric" Phenomenon.

To the Editor of the Scientific American:

Permit me in a few hurried words to return to the as yet unexpired subject of Mr. Edison's "etheric" force. Had I time, I would prefer to make my part of the discussion more exhaustive in point of enumerated contra-experiments; but enough remains, without, to expose the fallacies of the speculation. The only way in which I can account for the mystifications of several writers and experimenters on "the new force" is that they have become so involved in the pursuit of an idea that they absolutely are unable to extricate themselves from a position in which a thing, in reality perfectly ordinary *per se*, seems perfectly extraordinary simply because beheld under ultra-ordinary conditions.

The idea of J. P. H., who sees nothing inexplicable in obtaining a spark from an uninsulated wire laid upon wet earth and connected to an insulated source of power, although it has been endeavored to controvert him, strikes the bottom of the whole thing. There is no such thing as a non-conductor of electricity; there is merely a difference in degree of conductivity, an assertion of which dynamic electricity furnishes the proof. The only difference between dynamic and galvanic electricity is the difference of intensity. We use simply a battery to produce the galvanic current. This furnishes us with an atomic vibration of a certain force, which, unless the battery consist of a great many cells, say 2,000, so that the force of the first cell is augmented by the separate forces of the 1,999 other cells, will not give sufficient intensity to disrupt or discharge. By sending the battery current through a helix, over which is placed a secondary helix of a great number of convolutions, the atomic vibrations of the battery current in the primary helix are multiplied as many squares of times as there are layers of the secondary wire around it, and the result is disruption or a spark from the secondary wire, many inches in length. It is as though we were to project a ball from a cannon, and, with inconceivable rapidity, supplement the primary force in succession with the force of a million additional cannon. It is not difficult to calculate the increase of impact in which intensity exists. For instance, if the primary helix shall consist of 6 layers of 100 coils of wire, we shall, in the primary helix alone, have increased the battery impact 36 times. Taking the atomic vibrations of the battery at 1,000,000,000 per second, we have here alone 36,000,000,000 impacts per second. The secondary helix will consist of 500 coils, making the increased impact five times 36,000,000,000, or 180,000,000,000 per second. The secondary helix will consist of 100 layers, and the impact by induction will be increased 100 times 100 times, or 10,000 times, giving an atomic impact of 1,800,000,000,000,000 per second as the result. Is it at all remarkable that this impact, or "kick," results in disruption, or forcing the electricity through what to the direct battery is practically a non-conductor? Or is it remarkable that, if the polarity of the impact is so instantly reversed that it is practically destroyed as soon as created, physiological or mechanical effects should not be produced in the 1,800,000,000,000,000th part of a second? I have let a person stand on the most perfect insulation, holding a wire leading to one end of such a secondary wire, the other end of the secondary wire resting upon an insulator, and sparks have passed in rapid succession from my finger, I standing upon a carpet, to the insulated person, often an inch or therabouts in length; yet the only circuit for the current was from the free end of the coil (through the insulator, table, dry carpet, thirty feet of wooden floor, carpet, and myself) to the person holding the other end of the coil. Supposing the free end of the coil had passed through 10 or 50 or 100 miles of wet earth, entirely uninsulated, and finally the end were laid upon the table, what would have been the difference in the spark passing from my hand to the person? I answer, and any competent electrician will understand and acknowledge it, none whatever

I might have expressed myself in much stronger terms than in my communication on page 36, but several considerations prevented my doing so. I do not, therefore, characterize the speculation as a deception, for the reason that the advocates of the etheric force may sincerely believe in it; but I do not hesitate to pronounce the whole thing, both as concerns the public and in a scientific point of view, as one of the flimsiest of illusions.

As stated in the article by Dr. Vander Weyde, on page 89, the conclusions of Dr. Beard are tinged with some disregard of the laws of static (or dynamic) electricity; and while Dr. Vander Weyde cannot technically agree with my views, I do not see but that he does so practically. He explicitly asserts his belief, precisely my own, as set forth in my communication, that the observed phenomena are due to induction, induced electricity of alternating polarities; and excepting on some minor points, I do not see that Dr. Vander Weyde is not an essential advocate—originative of my own position, however much he may differ from me in respect of the theory of atomic vibrations, which is by no means a part of this discussion.

But assuming that the etheric force is something, the question of its practical value is narrowed down to its utility as a telegraph; hence

1. To be of any real value it must be as direct and simple in its operation as the Morse telegraph; or

2. It must enable the construction of telegraph wires on an extremely economical scale; and this must cover the capabilities of the force in respect of a single wire as regards the capabilities of the Morse telegraph in respect of a single wire.

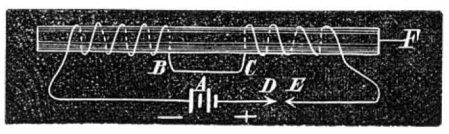
It clearly does not and cannot meet the first requirement. Therefore it must do a great deal in respect of the second; and how does it meet the second requirement?

The ordinary telegraph can be constructed, poles and all, for $150 per mile; each additional wire on same poles for $60 per mile. As the etheric force is assumed not to require insulation, if we place its wire upon poles we shall save merely 40 insulators at 12 cents a piece to the mile, or $4.80. This certainly is not practical value.

If, on the other hand, we place our wire underground, it will cost us, naked, at the very least $150 per mile, and the wire would not last so long as upon poles. Nor, certainly, is this practical value.

A higher speed of transmission than 500 words per minute over a single line is useless. The automatic telegraph yields a greater speed, yet it is a practical failure, for it does not and never can meet the requirements of a business telegraph, and I make this assertion while I am the inventor and possessor of such a system, obtained by considerable study and an expense of many thousand dollars. Taken in all or any one of its bearings, I contend that I have proved the practical inutility of the "etheric" force, and this is assuming that we really have found something or other capable of something or other: whereas, when we scrutinize the subject, we find that we have only wild speculation as to having found something or other capable of something or other, which, at best, even if realized, will cost as much, or nearly as much, as what we already have, be of no increased value and involve a complete innovation in affairs.

After all that has been made public, almost any person ought to be able to experiment intelligently with the etheric force. About as easy a way to get a sight of this ethereal etherity is as follows:



Take a bar of iron, F, and wind it with insulated wire, starting from the — pole of the battery, A, and passing in one direction round to B; then to C, and from C winding in the opposite direction around the bar, terminating at the contact point, E. From the + pole of the battery connect with contact point, D. Be careful to make the helix from battery to B and from E to C identical as to resistance in ohms and number of convolutions. There should be at least 10 layers of wire, the bar being about 7 inches long. The bar should be bent to form a horseshoe; when the contact points, D and E, are brought together, an armature is not attracted, as both ends of the bar are of the same polarity. Now separate the points, D and E, and you will get a bright spark, in which the polar effect of one portion of the coil is instantly neutralized by the polar effect of the other portion.

In order to bring the subject of the "etheric" force to a focus, I pronounce as utterly absurd, and challenge a demonstration to the contrary before competent and unprejudiced witnesses:

1. The statement that the etheric force can be transmitted, say from New York to Philadelphia, over a really uninsulated single wire: that is to say, the wire, if an ordinary wire, shall have such ground connections at different intervening points that a galvanic battery current will be completely short-circuited and unable to pass from New York to Philadelphia.

2. The intimation that the etheric force can be transmitted any distance, say one half mile, through the gas pipes of a city: provided there shall be no return wire, but simply an earth plate at the distant terminal, and that the area of the earth plate shall be the same as that of the ordinary earth plate at telegraph stations, and that the earth plate shall be imbedded in earth no more moist than that through which the gas pipe passes.

As I am prejudiced, I cannot, of course, witness the interesting proceedings I propose. W. E. SAWYER.

New York city.

The Original Oil City.

The readers of the SCIENTIFIC AMERICAN, or at least as many of them as are interested in the subject of the petroleum products, have a general notion of the machinery used for boring for oil, and for pumping, refining, storing, and transporting it. To such readers, as well as to those who are acquainted with the details of oil apparatus, an account of how they do these things in Asia will not be unacceptable.

The peninsula of Apsheron, at the southwest corner of the Caspian Sea, abounds in naphtha springs. The oil wells, fifteen years ago, yielded an annual product of about 4,000 tuns, which is now probably much increased. The wells find oil at an average depth of about 150 feet. These wells are about 1 foot in diameter, and the pumping apparatus is among the most simple A tube, 9 feet long by 9 inches in diameter, furnished with a valve which opens when it touches bottom, is lowered and raised by a steam engine. This machinery lifts in a day about 500,000 lbs. weight of crude petroleum. The tube is lifted clear of the ground, and then (by hand) emptied into a conductor, whence it runs to a reservoir, rudely dug in the ground. From this reservoir, the oil is dipped in buckets and transferred to leather sacks or barrels, for removal. The price of the crude article at the reservoir is about 10 cents for 100 lbs., or five times cheaper than the usual price of crude petroleum in the Pennsylvanian oil regions.

The steam machinery is driven with petroleum for fuel. At the mouth of the firebox, a small stream of petroleum trickles from a tap, and a steam blast blows it, in continuous jets of spray, into the fire. The same description of apparatus is used on the steamboats which navigate the Caspian Sea. The port of the district is Baku, having about 5,000 inhabitants and an antiquity which is shown by the fact that remains of ancient buildings are found in the earth at a depth of 18 feet. Baku will soon be united to the Black Sea by a railroad, now in process of construction, over a distance of about 200 miles. On this road, petroleum steam engines will drive the locomotives, and the Euxine or Black Sea and the Mediterranean will probably be traversed by petroleum-driven steamers. On the Caspian Sea, the boats burn petroleum at a cost of about $1 (one and a half Russian roubles) per hour, while for coal the cost is twelve times greater. In the Mediterranean and the Black Sea, the disparity would not be so great; but the difference in cost would probably leave a large margin in favor of petroleum. At Baku and on the peninsula, both petroleum and the gas which issues from the ground are used in distilling and refining. They are applied in lime burning, and for various other purposes, cooking included, it is to be presumed. It is curious that, while for unnumbered ages petroleum has been so readily accessible at this and other points in the old world, its commercial value was left to be ascertained in the new; and that twenty-five years practical knowledge of the article in America has sufficed to make kerosene a leading article in the world's consumption and commerce. But the Asiatics—or to speak more correctly, the Russians—appear to have been good pupils, and are, in some respects, in advance of us. Their steam machinery may be rude; but they are before us in the practical use of petroleum as fuel. The Baku article is said to be less inflammable than ours, its flashing point being 40° higher.

Baku is the chief city of a province of the same name, now held by Russia, formerly a part of Persia, and still largely populated by Persians. It is only within the memory of the present generation that the Russians reduced the formidable Circassian chieftains to obedience. That accomplished, Russian activity is now turned, as in other places, to the development of the resources of this country. On the peninsula where the oil is found is the "Field of the Eternal Fires," where the Guebers or Parsees (fire worshippers) of old had altars and temples; and the burning gas made the spot holy ground, the point of pilgrimage for thousands of worshippers. Now there are no pilgrims, or next to none; the Persian inhabitants of the spot are more bent upon utilizing the sacred fire than adoring it. Few altars remain, and their few priests come from a distance to mortify the flesh, as the spirit is mortified by the desecration of the eternal fires: the ancient cultus is burning out in lamps, furnaces, and steam engines. *Tempora mutantur.* Times are changed, when the wandering correspondent of the London *Telegraph* (from whom we draw the recent facts in the above statement) could hire a despondent priest of the ancient superstition, by a couple of roubles, to perform his incantations.

Exhibition of Scientific Apparatus.

The Science and Art Department of the British Government, South Kensington Museum, is about to open a Loan Exhibition of Scientific Apparatus on April 1, 1876, to remain open until the end of September.

It will consist of instruments and apparatus employed for research and other scientific purposes, and for teaching. It will also include apparatus illustrative of the progress of Science and its application to the arts, as well as such as may possess special interest on account of the persons by whom, or the investigations in which, it had been employed. Models, drawings, and photographs will also be admissible, when the originals cannot be sent. The apparatus may, in certain cases, be arranged in train as used for typical investigations; and arrangements will be made, as far as it may be found practicable, for systematically explaining and illustrating the use of the apparatus.

Persons desirous of exhibiting should send to the Director of the South Kensington Museum, London, S. W., for further information. Briefly, it may be said that the apparatus for teaching arithmetic, including calculating machines of every description, and for teaching geometry, with the instruments used for geometrical drawing, in copying, in making graphic representations, with models of all descriptions, head the list. Measurement, kinematics, statics, dynamics, molecular physics, sound, light, heat, magnetism, electricity, astronomy, applied mechanics, chemistry, meteorology, geography, geology and mining, mineralogy, crystallography, etc., and biology, are all to be represented, with such fulness of detail as may serve to illustrate in a most striking manner the means and materials of scientific research and advanced education. The Exhibition is favored by the savants of the continent as well as Great Britain. There is a vast amount of similar material in the United States, some of it, such as the great collection in the Stevens Institution of Technology, of much historic interest, and no pains should be spared at the approaching Exposition to bring it together, and present it in a similar manner.

TO cure the intolerable itching that always follows frost-bitten toes, it is necessary to exclude the air from the affected part. If it is not accompanied with swelling, gum shellac dissolved in alcohol, applied so as to form a complete coat, is the easiest remedy we know of. It dries soon, does not adhere to the stockings, and generally lasts until they are well. If the flesh becomes swollen and painful, plasters of good sticking salve are of great service; but if highly inflamed, use any mild poultice that will exclude the air from the diseased part, and keep it moist, doing the rest.

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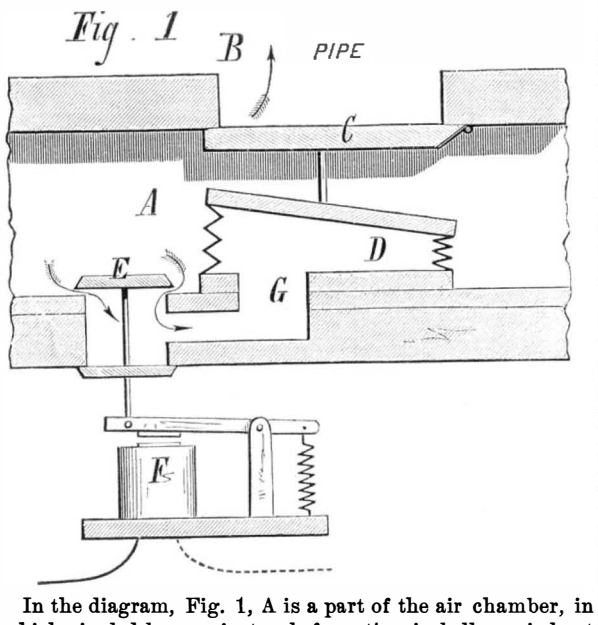
NEW APPLICATIONS OF ELECTRICITY TO ORGAN BUILDING.

A concert organ has recently been erected in Chickering Hall, corner of Eighteenth street and Fifth avenue, in this city, which is remarkable for the numerous entirely novel and ingenious electrical and pneumatic inventions which enter into its construction. The instrument is one of considerable magnitude, having three manuals, a compass of 58 notes, 29 pedal notes, 33 stops, and the necessary couplers and mechanical accessories. So far as the location of its parts is concerned, it is really three organs in one; that is to say, a portion of the pipes are on one side of the stage, a portion are some 60 feet away on the other side, while a complete though small organ, used for echo effects, is placed on the roof of the hall and about 175 feet distant from the single set of keyboards at which the entire apparatus is manipulated.

The portion of the instrument which is directly in rear of the keyboards is provided with pneumatic levers, so that the pressure on a key, instead of acting directly upon the valve of the pipe to be sounded, opens a valve which admits air into a small bellows. The latter, in its movements, actuates the pipe valve, and thus performs the heavy work, so that the merest touch is sufficient to move the key. With the exception of this ingenious pneumatic device, all the rest is directly mechanical, and, since it does not differ from the usual church organ arrangements, needs no further reference. In the other two organs, however, are found the curious electro-pneumatic inventions which have seemingly revolutionized the art of organ building, for by their aid not only can new effects be produced, but one or a dozen organs can be played at once, and all their stops perfectly controlled, and this irrespective of whether they are located within ten feet or ten miles, or in fact any distance, from the player.

We propose to explain, by the aid of the annexed diagrams, first, how the pipes are sounded through pressing the keys, and, second, how the stops are manipulated. For the benefit of those unfamiliar with organs, it may be stated in advance that, by means of stops, air is admitted from the main bellows into any desired set or sets of pipes. Each set of pipes gives a different quality of tone, and thus the performer may select just such sounds (flute-like, trumpet-like, etc.) as best suit the character of the music. Having regulated his instrument by adjusting the stops, his fingers, by pressing the proper keys, open the valves leading to the individual pipes, and thus the instrument is played. In order to apply electricity to the object first mentioned above, it will be obvious that the keys must act exactly as do the keys of an ordinary telegraph instrument, that is, on being pressed down, they must establish a current which, passing over a connecting wire, actuates mechanism at a distance. This is precisely the case, so that the organist has no power to exert beyond the very light pressure necessary to so move the keys. Each key controls its own circuit; and as the mechanism is the same for each, a description of one will suffice for all.

Fig. 1

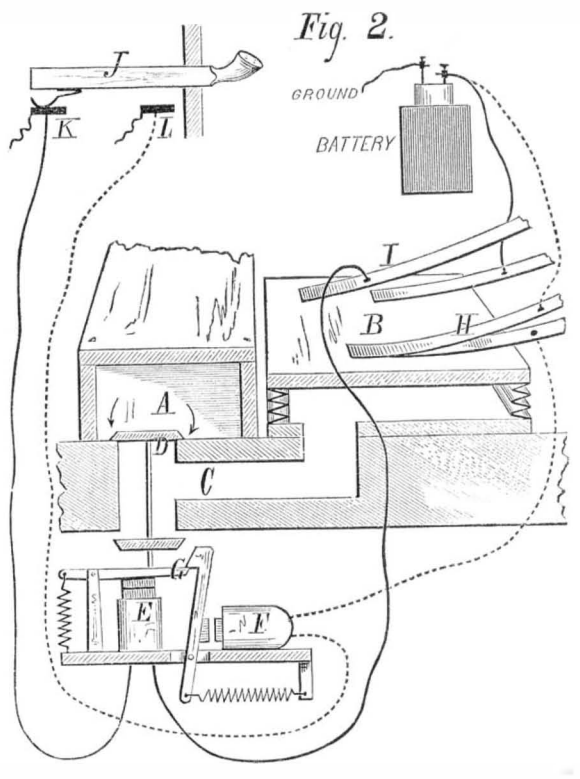


In the diagram, Fig. 1, A is a part of the air chamber, in which air, led by an air trunk from the air bellows, is kept compressed. B is the pipe corresponding to the key whose operation we are considering. There is an opening between the air chamber and pipe, closed as shown by the valve, C. Attached to this valve is a small bellows, D. Through the bottom of the air chamber is another orifice in which plays the double valve, E, the stem of which is continued downward and is attached to the pivoted armature of the electro-magnet, F. Said armature is provided with a spiral spring, the effect of which is to hold it away from the magnet and so to shut the lower part of valve, E, while holding the upper part open. This being the case, a portion of the compressed air in A will pass under the valve, but, being unable to escape at the orifice below, will enter the channel, G, and so ascend into the bellows, D. There will therefore be a constant equilibrium of pressure about the bellows, and thus the valve, C, will be pressed tightly shut against its seat.

When, however, the key is pressed, then the circuit is established, and the magnet, F, becoming excited, draws down its armature, thus shutting the upper part of valve, E, and closing the lower part. The air in the bellows, then being free to escape through the passage, G, cannot equilibrate the pressure in the air chamber, and hence the bellows closes, and at the same time pulls down and opens the valve, C. A blast of air is then free to enter and so sound the pipe. This state of affairs holds as long as the key is held down; but the instant it is released, the circuit is broken, and the various parts regain their normal position. The apparatus is extremely sensitive, and in its prompt action even surpasses the damper movement of a fine pianoforte; so that, in fact, the quickest passages and shortest notes can be played with a clearness, crispness, and brilliancy hardly otherwise attainable. Of course the intervening distance between this mechanism and the keyboard is practically immaterial so long as there is sufficient battery power. In the echo organ, previously referred to as located in the roof of the building, six Leclanché cells are found amply sufficient, although there are some two miles of connecting wires. This very light battery power required, in fact, is characteristic of the whole instrument.

Having seen how each key is worked, we now pass to the means whereby the whole set of 58 keys is caused to control any desired set of pipes. In Fig. 2, A is an air chamber or wind box, fed as before from the main bellows. The small bellows, B, in this case is located outside of the chamber but communicates with it by the passage, C, in which is a double valve, D, similar to valve, E, in the preceding diagram. When the upper part of valve, D, is raised and its lower part closed, there is a free passage for the air to pass from the wind box and into the bellows. When the valve is lowered, as represented, there is a clear passage from the bellows to the outside air. The stem of valve, D, is connected with an electro-magnet, E, arranged as previously described. There is, besides, another magnet at F, which controls a moving armature, G, one end of which forms a latch and engages with the armature of magnet, E. On top of the bellows are two pairs of springs, one pair, H, being in control only when the bellows is down, the other, I, being in like condition only when the bellows is inflated. J is the stop in the organ, on the lower side of which is a switch which comes in contact with one or the other of the metal plates, K and L, according as the stop is pushed in or drawn out. The lead of the circuits is first from plate, K, to magnet, E, thence to the upper spring of pair, I: from the lower spring of same pair to the battery. The second circuit passes from plate, L, to magnet, F, to lower spring of pair, H: from the upper spring of same pair to battery. The object is to move the bellows, and this last moves a series of switches oscillating on a horizontal axis so as to establish connection in 58 key circuits at once. When the stop is pushed in as shown, there is obviously no connection with the battery, because of the pair of springs, I, being separated. Supposing, however, the stop to be drawn out, then the switch on its lower side comes in contact with plate, L, the current passes and excites the magnet, F, which draws back its armature, G, and so releases the armature of magnet, E, the current of course continuing through the pair of springs, H, and so to battery. But the effect of releasing the armature of magnet, E, is to raise the valve, D, so that, as before stated, the air from the wind box is allowed to pass through the passage and into the bellows. The latter then rises, throwing over the 58 switches and so establishing the connection of the keys. But as this rising continues, the springs, H, separate. The circuit is thus broken. At the same time the pair of springs, I, come in contact. The bellows remains, however, inflated, because the position of valve, D, remains unchanged, no circuit being complete through the springs, I, and magnet, E, until the stop pushed in establishes connection with plate, K. Consequently the bellows will stand full and thus push the switches into action as long as the stop beside the keyboard is drawn out. When that stop is pushed in, the circuit closes, magnet, is, E excited, and valve, D, drawn down, cutting off any further supply of air to the bellows, and opening an escape for its contents. As valve, D, falls, the catch on armature, G, slips over the armature of magnet, E; and as the bellows descends, springs, I, once more separate, and thus the parts are again brought to the condition shown in the diagram.

Fig. 2.



It will be observed that this is all done with an open circuit: that the circuit, in fact, is always open, except just when changes are taking place, so that, with a battery like the Leclanché, which stands out of operation when there is no circuit, the exhaustion of the same is very slow and the cost consequently light.

There are various other ingenious attachments of less importance than the foregoing, which are hardly necessary to be described. The credit of the inventions belongs to the builder of the organ, Mr. Hilborne L. Roosevelt, of New York city, and at some future time we shall probably recur to them again.

Beware of Him.

A correspondent writes from Chatham, Ont., that a man, representing himself to be an agent for the SCIENTIFIC AMERICAN, had obtained a number of subscribers in that place and its vicinity. To make the deception more complete, the fellow pretends to be an artist, and represents himself to be authorized by us to make sketches of machinery, public buildings, manufactories, etc.; and he has probably received some money besides for his artistic services, but concerning this the writer does not speak.

If our friends would bear in mind what we so often repeat, that no traveling agents are employed to solicit subscriptions for the SCIENTIFIC AMERICAN, they will save their money and preserve their tempers. We frequently get letters from persons complaining impatiently that they do not get their papers, and adding, after relating the circumstances of their paying their money to some itinerating scamp, that, if he was not authorized to receive their money, it is our duty to follow him up and have him arrested for swindling. Such persons seem to forget that, if they had used the slightest precaution, they would have avoided being swindled. We ask the public to remember that we do not employ traveling agents; and if persons pay their money to irresponsible parties, they should not blame us or expect that we can make their losses good.

Business Prospects for 1876.

Now that everybody has balanced his books and has determined his profits for the year gone by, the future, in place of the past, has become the object of general concern, and questions as to the condition of trade and business prospects for the next twelve months are in every one's mouth. While we note no especially great activity in business circles generally, in our own case we certainly find much cause for self congratulation. Subscriptions to the SCIENTIFIC AMERICAN for 1876 are literally pouring in, in numbers in excess of all previous years; and our new paper, the SCIENTIFIC AMERICAN SUPPLEMENT, has met with a reception exceeding our most sanguine anticipations, placing its success beyond a shadow of doubt. Than these facts no more gratifying evidence of the constantly increasing taste and demand for scientific information could be found; nor could those, who, like ourselves, believe in the advancement of the country's prosperity through the diffusion of useful knowledge, receive more flattering proof that efforts in that direction are by our industrial classes fully appreciated and rewarded.

We would ask all our friends who have not as yet renewed their subscriptions, and all who are engaged in forming clubs to send in their names as rapidly as possible. We continue to forward back numbers, dating from January 1, to all new subscribers, unless specially ordered to the contrary. Those who can conveniently patronize local news dealers, we advise to do so, since they then receive their papers free from the creases necessitated by the folding for the mail; and at the same time they patronize a useful home enterprise, which deserves their encouragement.

A Remarkable War Ship.

In illustration of engineering progress, we give in this week's SCIENTIFIC AMERICAN SUPPLEMENT (No. 8) an interesting article descriptive of the new British man-of-war Inflexible, with diagrams, showing the dimensions and made of operating her enormous guns. This ship is now in course of construction at Portsmouth. Her iron armor is to be two feet thick. The ship is 320 feet long and 75 feet wide, and is to carry two 81-tun guns. These guns will have an exterior diameter of 6 feet, 24 feet length, and 16 inches caliber. The projectile weighs 1,650 lbs., and over a barrel of powder (300 lbs.) is the firing charge. The vessel's engines will be of 7,000 horse power, operating on twin screws. The hull will have 127 watertight compartments. Altogether the Inflexible is the most wonderful specimen of naval architecture ever undertaken.

Useful Recipes for the Shop, the Household, and the Farm.

Dried potatoes, which may be kept any length of time, and which, when boiled with a little salt, are not distinguishable in taste from the fresh vegetable, are prepared as follows: After being peeled and cut into disks, they are treated with cold water to which has been added 1 per cent of sulphuric, or 1 to 2 per cent of muriatic acid. Washing in pure water follows, and the pieces are then placed on wire frames and dried in an oven. When done, the disks are of a slightly yellowish tint, and are transparent, like gum.

Dry earth treatment for ulcers has been found very successful. Large, sloughy ulcers, after being washed, were covered with a thick layer of earth, over which a piece of wet paper was placed as a support, the whole being neatly bandaged. In a few days the ulcers began to clear, and when the surfaces looked healthy and granulating, a dressing made as follows was used: A piece of muslin the size of the ulcer was immersed in carbolic oil (in the proportion of 1 part acid to 10 parts cocoanut oil); with this the sore was covered, and over that dry earth was placed, and then moistened earth and a bandage. In a short time the healing process manifested itself satisfactorily, while all odor was entirely removed.

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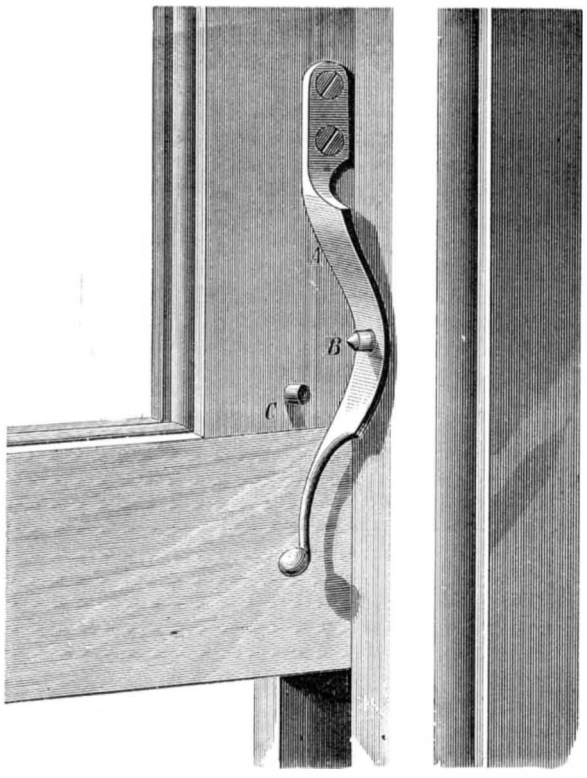
IMPROVED SASH FASTENER.

We illustrate, in the annexed engraving, a new and simple sash fastener, which, when secured, prevents the opening of sashes from the outside, and also their rattling by the wind. A spring band or latch, A, is screwed at its flattened upper end to the sash frame. Its middle portion is bent toward the window frame, and its lower part is carried outward to serve as a handle. In the middle part is a perforation which locks, by the spring action of the latch, on pins arranged along the frame, and one of which is shown at B. By releasing the latch, the sash may be raised or lowered; and by catching the former over the pin, it is retained securely in the required position. A stop pin, C, placed on the sash, back of the spring latch, defines the rearward motion of the



latter, so that it clears the pin on being released without being thrown back too far and thus impairing the efficiency of its spring.

Patented through the Scientific American Patent Agency, June 22, 1875. For further particulars, and for samples of the device, address the inventor, Mr. Peter Meyer, P. O. Box 1,221, Iowa City, Iowa.

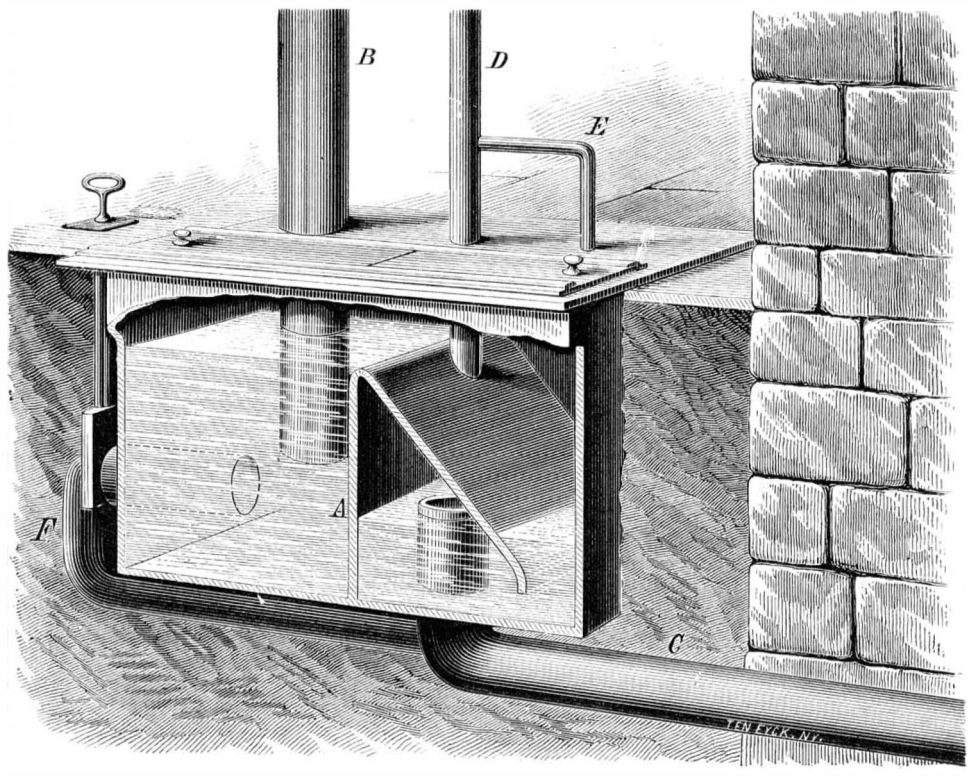
IMPROVED SEWER GAS TRAP.

We have so frequently pointed out the dangers of sewer gas, when the same is allowed to escape into a dwelling through defective plumbing work, that it is hardly necessary again to draw the reader's attention to the great importance of means for preventing its entrance. It is very probable that a large proportion of such diseases as diphtheria, small pox, and typhoid fever, which rage in large cities, are directly owing to this cause. Nor do these effluvia arise solely in the tenements and rookeries of the city. It is a well known fact that epidemics of disease have suddenly appeared in buildings in some of the finest localities, from the neighborhood of which, to all appearances, filth is entirely absent. Only recently, and the circumstance seems to have escaped the notice of the daily journals, one of the largest and most costly edifices, devoted to French flats or suites of apartments in New York, was visited by diphtheria in violent form, hardly a family in the building escaping the visitation; and the cause was plainly traced to defective sewer connections.

The object of the invention here illustrated is to interpose an effective barrier to the entrance of sewer gas to any portion of the house pipes; and to this end, the apparatus is located at the point where the sewer connection enters the building, just inside the wall of the latter, so that all refuse must pass through it before reaching the street drain. It consists of an iron box, having a central diaphragm, A, which is bent down to form a slide, as shown, the lower edge of the bent part not reaching the bottom. B is the main drain pipe of the house, which terminates in the left hand chamber, which thus forms a trap. After entering the latter, the sewage runs over the slide and into the right hand chamber (which is thus another trap), and finally escapes by the pipe, C. This pipe, it will be observed, terminates under the slide, so that its end is really in a separate compartment, entirely cut off, airtight, from the rest of the box by the water seal. To carry off the emanations arising from the open end, the pipe, D, which passes through the diaphragm, leads directly up to the roof of the house, and to the pipe, D, a smaller bent tube, E, is connected, so as to lead off into the same conduit such gases as may arise from the material outside the slide, and to prevent siphoning between the traps. In case the main drain pipe, B, does not communicate with the roof, as is almost always the case, a crosspipe may be led therefrom to the pipe, D, so as to prevent any siphoning which might take place in the first trap of the apparatus through said main pipe. The sliding doors shown above are for giving easy access to the interior.

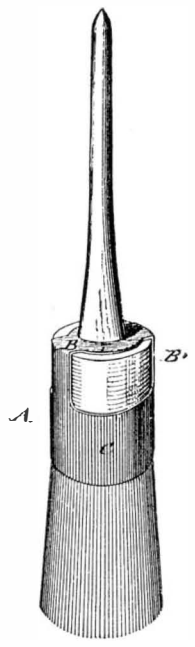
The inventor, who is a practical plumber, claims that this device shuts out completely all sewer emanations from the house which it guards. He points out that it is practically impossible for the gases, even under any pressure which might be generated in the drain pipes, to make their way back through two constantly sealed traps, especially when the convenient outlet offered by the roof pipe, D, is already open to them. No alteration of the plumbing arrangements of the building is required for its insertion, that operation being performed as quickly and as easily as that of placing an ordinary trap in the cellar drain. The pipe, F, serves as an efficient mode of clearing the first chamber in case any sediment should accumulate. It is provided with a valve as shown.

For further particulars address the inventor, Mr. J. T. Campbell, 1,284 Broadway, New York city.



CAMPBELL'S SEWER GAS TRAP.

IMPROVED BRUSH BINDER.



Mr. John Blair, of Boston, Mass., has recently patented a new binder for the bristles of paint and other brushes, which, he claims, is tightly fitting and quickly adjustable, and holds the bristles firmly together where they are in connection with the ferrule. It consists of a continuous piece of soft rubber, which is attached by a cylindrical band in the bristles below the ferrule, and by connecting the perforated yoke part to the ferrule and handle. The ferrule has side openings, which allow the head of the brush to be grasped.

In the engraving, A represents the improved brush handle or binder, which is slipped over the brush handle by its centrally perforated yoke part, B, until it is seated at the base of the same on the bristle ferrule. The yoke, B, connects by its side pieces, B', over the ferrule to the cylindrical main part, C, of the bridle, which is made in one continuous piece therewith, fitting tightly around the bristles below the ferrule, and binding firmly, yet yielding thereon, so as to prevent the paint from rising to the upper part of the bristles. The binder is used with the brush until the bristles are worn down, preserving, in the meantime, the upper part of the bristles in their original condition.

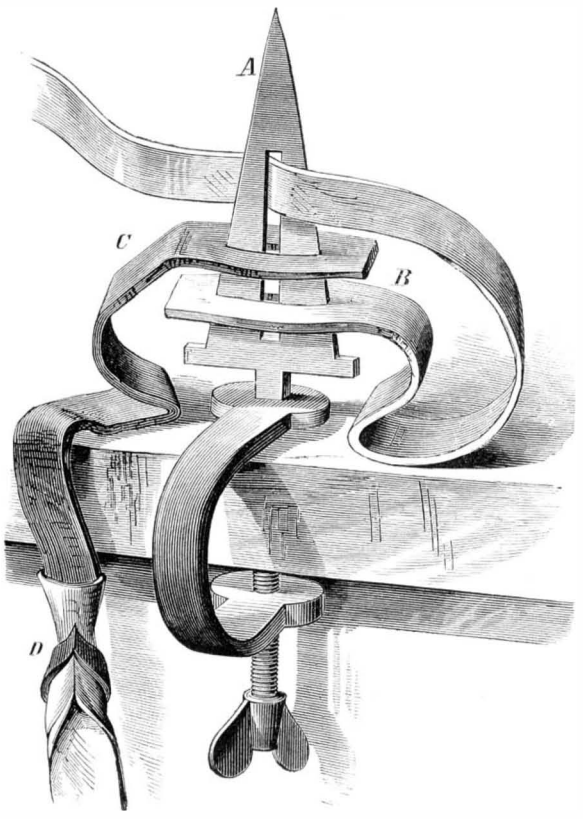
Discovery of an Ancient City.

It is related in Russian journals that, during the recent military survey of the steppes, east of the Caspian Sea, the soldiers discovered the ruins of an ancient city, the existence of which has been utterly unknown in modern times. Judging from the ruins, the city must have had a large and fixed population. Several Arabesque minarets are still well preserved, and bear evidence of the skill of their builders. Remains of extensive aqueducts were also found, some of them still flowing with good drinking water. A number of inscriptions were copied by the officers of the expedition, and brought to St. Petersburgh. According to a tradition of the Turcomans, the country was once very fruitful, and was watered by means of a canal.

IMPROVED CARPET RAG LOOPER.

A new and simple device for securing together the ends of the strips of rags used in weaving carpets is illustrated in the engraving herewith given. It affords a very quick and easy way of performing the operation, and at the same time is so constructed that the rags cannot become caught or tangled so as to necessitate delay to remove them from the apparatus. It seems to be an implement which will greatly facilitate the labor in hand carpet weaving.

A is a triangular slotted blade, having a reduced shank, which is suitably attached to a V-shaped clamp, by which the device is easily and firmly secured to the edge of a table. At the heel of the blade are formed short projecting arms, to keep the strips from slipping under the blade. The



mode of attaching the strips consists in passing the shorter of the two strips, B, over the blade first; then the second or longer strip, C, is forced over, and, finally, the end of B is brought through the slot in the blade. Both strips are then simultaneously lifted off the blade, causing the strip, B, to be drawn by a loop through the slits in both strips, thus forming a weaver's knot, as shown at D. The end of strip, B, is then pulled out of the slot.

Patented November 23, 1875. For further particulars, relative to proposals for manufacture, address the inventor, Mr. W. H. H. Wyckoff, Lesser Cross Roads, Somerset county, N. J.

Bacteria found in the Perspiration of Man.

Dr. Eberth, of Zurich, Switzerland, has found, says the *Medical Record*, by the aid of the microscope, in the sweat of the face some corpuscles which he considered as bacteria. This view became confirmed when he examined the axilla, breast, and inner side of the thigh of several persons in a state of perspiration. The sweat of these parts contained nearly always enormous numbers of bacteria. In most cases they originated from minute bodies found upon the hairs in the mentioned regions, forming little nodules on them, and giving them a grayish or a brick color. They were recognized by the author as accumulations of micrococci. They may rapidly increase in number, are smaller than the diphtherial micrococci, and are nearly indifferent to reagents (concentrated acids, alkalies, alcohol, ether, chloroform). Iodine colors them yellow. The vegetation of bacteria on the hairs may be observed in cases where they are changed already, beginning in places which have clefts between their cells. The vegetation occupies large spaces, especially in the direction of the longest diameter of the hair.

Dr. Eberth observed a mycelium and micrococci, and thinks that the latter are the fruits of the former. Other investigators observed colored sweat, red and blue, which contained micrococci. It was difficult to decide in these cases if the coloring matter was adherent to the micrococci, or if it was a product of the vegetation.

ORGANIC ELEMENTS AS ELECTRO-MOTORS.—It appears, from the author's researches, that the interior of a muscle is negative, which indicates that there is oxidation in the interior and reduction at the exterior, and that all organized bodies appear formed of—so to say—an infinite number of electro-motors, which intervene probably in the phenomena of nutrition.—*Becquérel.*

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IMPROVED COUNTERSINK FOR BORING TOOLS.

Mr. Richard J. Welles, of Kenosha, Wis., has recently patented an improvement in countersinks to boring tools, which is illustrated in our engravings. Fig. 1 is a side elevation of a boring bit with the countersink attachment. Fig. 2 is a side elevation of the attachment without the bit; and Fig. 3 is an end elevation. A and B represent the two pieces forming the countersink, said pieces being clamped on the bit shank, C, by screws, D, and having dowels, E, to aid the

Fig. 1

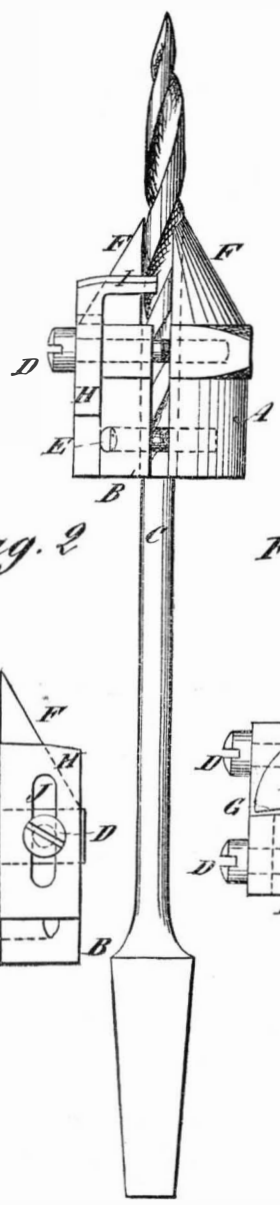


Fig. 2

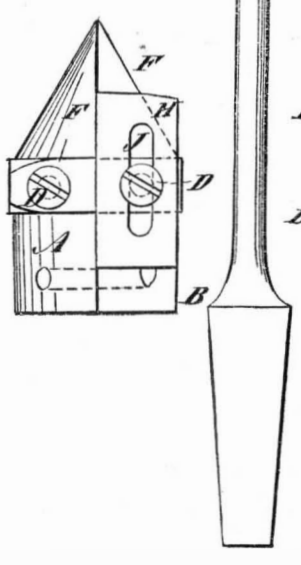
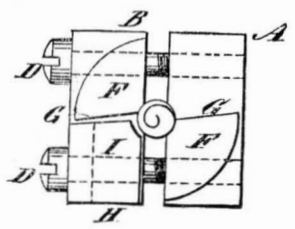


Fig. 3

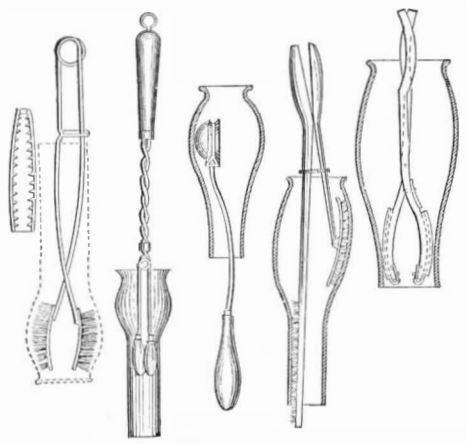


screws in keeping them in position. F represents the cutting points or bits of the countersink. They are in form about a quarter section of a cone, and arranged with their cutting edges, G, parallel to the clamping screws, D, so that they work alike, whether clamped to a large or small shank, C; and ample clearance is provided between the heel of one and the cutting edge of the other. H is the gage or stop for regulating the depth of the countersink. It is a small bar, with a foot, I, at the lower end, clamped to one of the pieces of the countersink by one of the clamp screws by which the two pieces are clamped to the bit, the screw passing through a slot, J, in the bar, to allow the latter to be shifted up and down, according to the required depth of the countersink. The pieces, A and B, are rounded at the upper end, to render the attachment capable of turning on the surface of the stuff without catching and binding on any irregularities thereof.

HOUSEHOLD DEVICES, GATES, AND HINGES.

Continuing our extracts from Knight's "Mechanical Dictionary,"* we select, this week, a number of interesting illustrations of devices pertaining to the dwelling, and also a

Fig. 1.



Lamp-Chimney Cleaners.

series of engravings showing a variety of forms of gates and hinges.

In Fig. 1 are represented several kinds of

LAMP CHIMNEY CLEANERS.

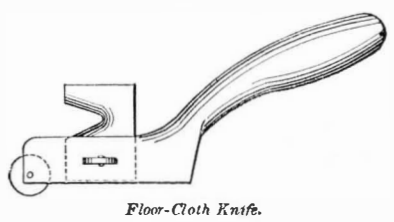
Beginning on the left, the first is simply a pair of brushes attached to the end of bent wire springs, which hold the brushes out against the interior of the chimney. The second device is essentially the same, a handle being added and pads substituted for brushes. The third is a single pad without springs. The fourth has brushes of different shapes adapted to the straight and curved portions of the chimney. The brushes in this case are pressed outward against the chimney by bringing the handles of the implement together. In the fifth device, curved pads replace the brushes, and there is a modification in the shape of the handles.

In order to facilitate the somewhat difficult operation of cutting oil cloth, a

FLOOR CLOTH KNIFE,

represented in Fig. 2, has been devised. In this the blade is

Fig. 2.



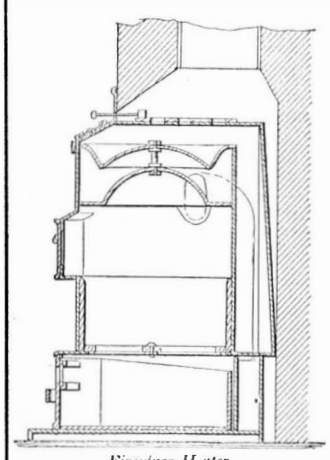
Floor-Cloth Knife.

notched and secured vertically in the lower portion of the handle; the latter is held above the floor by a caster. The edge of the cloth being placed in the notch, and its adjacent portion held, the knife, when pushed forward, makes a neat division, much more easily and accurately than it is possible to perform the same by hand, knife, or shears. The

FIREPLACE HEATER

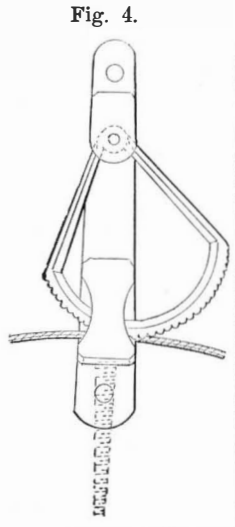
shown in Fig. 3, is set within the fireplace, and serves to warm the room, the pipes discharging into the chimney. The

Fig. 3.



Fireplace-Heater.

Fig. 4.



Clothes-Line Holder.

kind here especially represented is known as the Latrobe, and is base-burning. The pipe passes up the brick flue to heat the air which circulates between pipe and flue to the rooms above, into which it escapes through suitable registers.

Fig. 4 is a simple form of

CLOTHES LINE HOLDER,

designed to secure the line without necessitating the tying of the latter about its supports. It consists of a hook cast upon the main plate, and in a lug of the latter a serrated swinging segment is pivoted. The line is jammed between the serrated portion of the segment and the hook. The

GATES,

shown in Figs. 5 and 6, are as follows: *a* is a gate with adjustable hinges operating on rings on the post, the fastening consisting of a movable latch and staple. *b* shows a mode of setting up the gate, when the outer end sags, by means of the diagonal strut. *c* is another form of setting up the outer end, by means of a tie slat. *d* is a gate, whose top bar is pivoted on the post, the whole device being counterweighted by a box of stone on the extended bar. *e* slides longitudinally, its slats traversing on rollers. *f* is also a sliding gate, which has rollers to keep it level, whether open or shut. *g* is a gate which slides half its length and then rotates on a bar at its mid-length. *h* is a gate of pivoted bars, on the principle of the lazy tongs. *i* is a gate having a set of pivoted slats which assume a vertical position when the counterweighted top slat is allowed to oscillate. *j* is a suspended gate which swings upward, broadside, in a vertical plane. *k* is a gate suspended from pulleys and counterweighted. *l* and *m* are gates operated by equestrians or persons in vehicles by means of ropes.

The ancient Egyptian

HINGES,

which are probably the oldest devices of the kind now known, were crude affairs, and were very similar in construction to those made in our early Western log cabins. A pin projecting from the upper edge of the door was socketed in a vertical hole made in a bracket attached to the wall, and a similar pin on the lower edge of the door was stepped into a socket in the floor or threshold. The illustration, *a*, Fig. 7, is from a model house, found in Egypt by Mr. Salt, and now in the British Museum. The doors of Egypt were either single or double, and were secured by bars and bolts, as seen in the figure. The hinge pieces were usually made of bronze. *b* and *c* show the upper and lower door pins and the sockets, in which the edge of the door is received and in which it is secured by bronze pins. The projection on the upper piece was to keep the door from striking against the wall. *o* shows the general form of a door in remains of stone, marble, wood, and bronze. *p* is a bronze hinge in the Egyptian collection of the British Museum. *q* is the plan of the threshold of an ancient temple with the arrangement of the folding doors. *r* and *s* are four Roman hinges of bronze now in the British Museum.

Fig. 5.

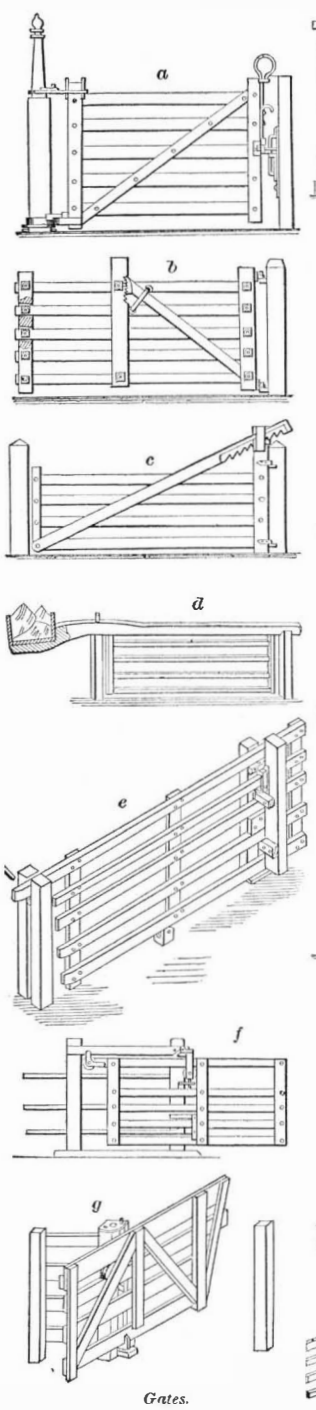
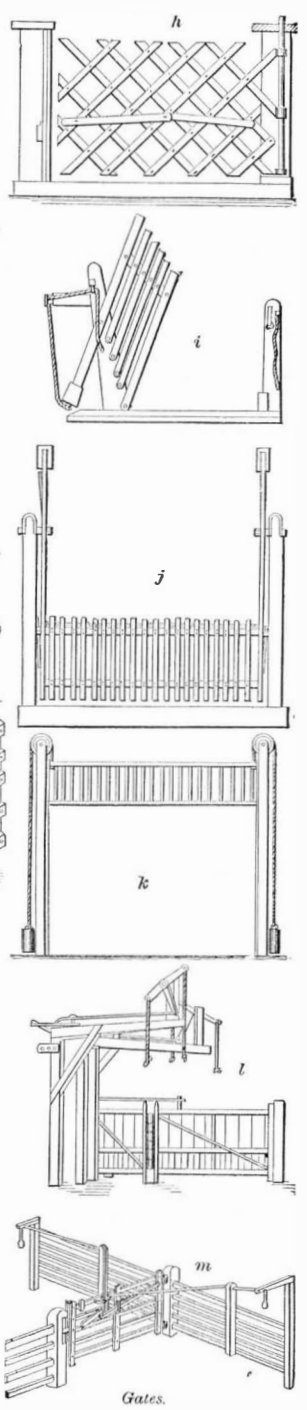


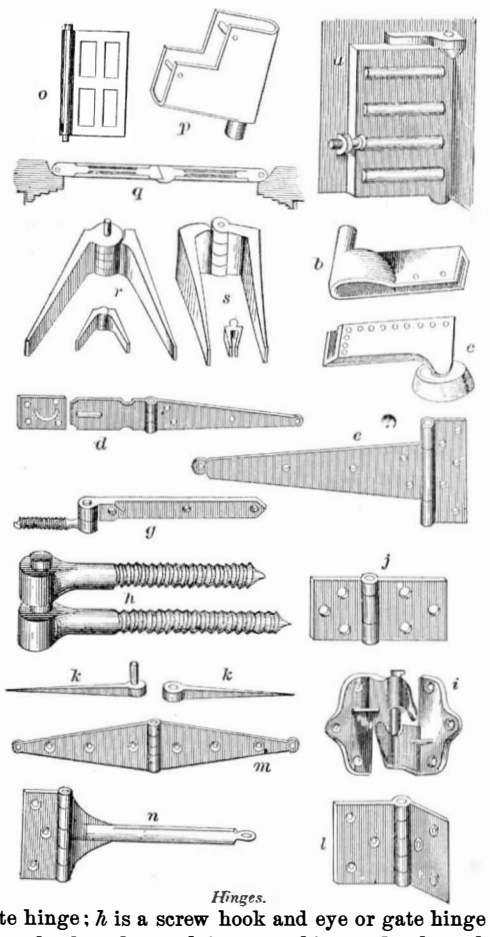
Fig. 6.



Gates. *Gates.*

The other hinges shown in Fig. 7 are designated according to the purposes to which they are applied, or with reference to some structural peculiarity of shape. Thus *i* is a loose joint or self-shutting or blind hinge; *g* is a screw and strap

Fig. 7.



Hinges.

or gate hinge; *h* is a screw hook and eye or gate hinge; *k* is simply a hook and eye; *l* is a butt hinge; *d*, a hasp hinge; *e*, a T hinge; *j*, a table hinge; *m*, a strap hinge; and *n*, cross garnet hinge.

*Published in numbers by Messrs. Hurd & Houghton, New York city.

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Abstract from the Congressional Annual Report of the Hon. R. H. Buell, Commissioner of Patents, for the Year Ending December 31, 1875.

Money received by the Patent Office during the year 1875	$743,453.36
Expenditures during the year	721,657.91
Balance to credit of Patent Fund, December 31, 1875	21,795.65
Amount standing to credit of Patent Fund in the Treasury of the United States, January 1, 1875	$865,113.97
Total balance to credit of Patent Fund, December 31, 1875	886,909.62

Statement of the business of the Office for the year 1875.

Number of applications for patents during the year 1875	21,638
Number of patents issued, including reissues and designs	14,837
Number of applications for extension of patents	2
Number of patents extended	38
Number of caveats filed during the year	3,094
Number of patents expired during the year	1,323
Number of patents allowed, but not issued for want of final fee	3,518
Number of applications for registering of trade marks	1,055
Number of trade marks registered	1,138
Number of applications for registering of labels	566
Number of labels registered	313
Of the patents granted there were to—	
Citizens of the United States	14,274
Subjects of Great Britain	358
Subjects of France	83
Subjects of other foreign governments	122

Comparative statement of the business of the Office from 1837 *to* 1875, *inclusive.*

Year.	Applications.	Caveats filed.	Patents issued.	Cash received.	Cash expended.
1837			435	$29,289.08	$33,506.98
1838			520	42,123.54	37,402.10
1839			425	37,260.00	34,543.51
1840	735	228	473	38,056.51	39,020.67
1841	847	312	495	40,413.01	52,666.87
1842	761	391	517	36,505.68	31,241 48
1843	819	315	531	35,315.81	30,776.96
1844	1,045	380	502	42,509.26	36,244.73
1845	1,246	452	502	51,076.14	39,395.65
1846	1,272	448	619	50,264.16	46,158.71
1847	1,331	553	572	63,111.19	41,878.35
1848	1,628	607	660	67,576.69	58,905.84
1849	1,955	595	1,070	80,752.98	77,716.44
1850	2,193	602	995	86,927.05	80,100.95
1851	2,358	760	869	95,738.61	86,916.93
1852	2,639	996	1,020	112,656.34	95,916.91
1853	2,673	901	958	124,527.45	132,869.83
1854	3,324	868	1,902	163,789.84	167,146.32
1855	4,435	906	3,024	216,459.35	179,540.33
1856	4,960	1,024	2,502	192,588.02	199,931.02
1857	4,771	1,010	2,910	196,132.01	211,582.09
1858	5,364	934	3,710	203,716.16	193,193.74
1859	6,225	1,097	4,538	245,942.15	210,278.41
1860	7,653	1,084	4,819	256,352.59	252,820.80
1861	4,643	700	3,340	137,354.44	221,491.91
1862	5,088	824	3,521	215,754.99	182,810.39
1863	6,014	787	4,170	195,593.29	189,414.14
1864	6,932	1,063	5,030	240,919.98	229,868.00
1865	10,664	1,937	6,616	348,791.84	274,199.34
1866	15,269	2,723	9,450	495,665.38	361,724.28
1867	21,276	3,597	13,015	646,581.92	639,263.32
1868	20,420	3,705	13,378	681,565.86	628,679.77
1869	19,271	3,624	13,986	693,145.81	486,430.78
1870	19,171	3,473	13,321	669,456.76	557,149.19
1871	19,472	3,366	13,033	678,716.46	560,595.08
1872	18,246	3,090	13,590	699,726 39	665,591.36
1873	20,414	3,248	12,864	703,191.77	691,178.98
1874	21,602	3,181	13,599	738,278.17	679,288.41
1875	21,638	3,094	16,288	743,453.36	721.657.71

THE CENTENNIAL.

The Patent Office is to be represented at the Centennial celebration, and a space of 10,000 square feet has been assigned for the exhibition of models of American inventions, illustrating the more important and useful industries. Models to the number of about 5,000 are being selected for this purpose, being about three per cent of the aggregate number in the possession of the Patent Office. These, while illustrating in part the progress of our country in "mechanical and manufacturing industries," and the development of American genius and skill, represent in one way only the results attained. Another mode of presentation of the facts and figures in the case is obtainable from the census report of 1870, and the general subject-matter index of patents granted since the year 1790.

MANUFACTURES OF AGRICULTURAL IMPLEMENTS.

In referring to the census, under the head of "manufactories in operation in 1870, exclusively for agricultural implements," it is found that the—

Number of establishments in operation was	2,076
Number of steam engines at work	676
Horse power	15,873
Number of water wheels at work	426
Horse power	10,209
Number of hands employed	25,249
Capital invested	$34,834,600
Wages paid	$12,151,504
Material used, value	$21,473,925

The census shows an increase of $34,578,825 in the value of agricultural implements manufactured over the amount reported in 1860, and of $45,224,174 over the amount reported in 1850, while the total value for the year 1870 of the "mechanical and manufacturing industries" aggregates the sum of $4,232,335,442.

The following are the products of agricultural implements of the manufactories first above referred to, being the articles manufactured and number made:

Cane mills	108	Horse rakes	80,919
Clover hullers	5,206	Lawn mowers	2,536
Corn planters	21,709	Mowers	39,486
Corn shellers	12,914	Plows	864,947
Cotton planters	2,000	Reapers	60,388
Cultivators	88,740	Reapers and mowers	59,645
Fanning mills	19,772	Rollers and scrapers	4,803
Grain cradles	103,646	Seed sowers	6,900
Grain drills	32,033	Scythes	881,244
Hand rakes	207,310	Scythe snaths	17,680
Harrows	9,150	Separators	1,131
Harvesters	3,566	Shovels	25,756
Hay and straw cutters	30,879	Sickles	300
Hay forks	1,298,260	Stump pullers	124
Hoes	135,139	Threshers	22,934
Horse powers	4,541	Other products	5,206,789

PATENTS FOR AGRICULTURAL IMPLEMENTS.

For the articles above enumerated, there have been granted between the years 1790 and 1873, inclusive—that is to say, since the organization of this Office (1790)—the following patents:

Cane mills	66	Horse rakes	373
Clover hullers	100	Lawn mowers	38
Corn planters	647	Mowers	173
Corn shellers	378	Plows	2,451
Cotton planters	173	Reapers	69
Cultivators	1,617	Reapers and mowers	61
Fanning mills	127	Rollers and scrapers	141
Grain cradles	18	Seed sowers	579
Grain drills	186	Scythes	50
Hand rakes	9	Scythe snaths	26
Harrows	329	Separators	334
Harvesters	2,244	Shovels	58
Hay forks	382	Sickles	13
Hoes	201	Stump pullers	191
Horse powers	415	Thrashers	732

MISCELLANEOUS AMERICAN PATENTS.

These indicate the scope and versatility of the inventive genius of our country, and all enter more or less into the "mechanical and manufacturing industries" that have been referred to. They are as follows:

Bee hives	645	Looms and appurtenances	1,210
Bending machines	144	Paper, manufacture of	269
Boots and shoes, etc	817	Pavements	404
Brick kilns and machines	808	Photography	346
Bridges	425	Planing machines	334
Brooms and brushes, etc	750	Propellers, etc	570
Buckles	388	Printing presses, etc	756
Burglar alarms	165	Railway apparatus	1,552
Burners, gas, lamp, and vapor	793	Roofs and roofing	506
Car brakes	485	Rotary engines	170
Car coupling	961	Saw mills and machines	1,981
Car wheels	314	Sewing machines, etc	2,295
Carriages, etc	1,495	Steam engines and apparatus	1,013
Churns, etc	1,391	Stoves	2,400
Clothes dryers and wringers	984	Straw cutters and machines	401
Curtain fixtures	364	Sugar mills and machinery	343
Fire arms	1,203	Telegraph and instruments	566
Gas and gas apparatus	1,359	Toys	300
Grain, cutting, binding, etc	135	Tobacco presses, etc	197
Grinding and grist mills	371	Valves	1,497
Lamps and appurtenances	1,483		

Total number of patents issued since 1836	171,640
Total number of reissues	6,830
Total number of designs	8,883
Total number of trade marks	3,287
Total number of labels	464

In presenting this annual report, the Commissioner makes several suggestions and recommendations for the improvement of business facilities at the Patent Office.

1. To the corps of one hundred examiners now employed, he asks for an addition of twelve more examiners. He also asks for the restoration of the grade of Third Assistant Examiners; and suggests that the duties of Principal Examiners ought to be defined by law.

2. He suggests that all decisions of the courts shall be published in the *Official Gazette*, such publication to have the same force and effect as if published by authority of the courts.

3. The publication of the back patents—those granted between 1836 and 1871—is urgently called for, as a matter of the highest importance.

4. The improvement of the Patent Office library, by an annual appropriation of $5,000, is suggested.

5. The necessity of enlarging the Patent Office is conclusively shown. From five to twelve persons are now compelled to occupy rooms averaging each not more than twenty feet square, this space being also reduced by the cases for letters, papers, etc.; while models have to be tucked away in the attic.

The Commissioner's Report is one of the most straightforward, practical documents ever issued from the Patent Office; and we hope that Congress will adopt the excellent suggestions it contains.

DECISIONS OF THE COURTS.

Supreme Court of the United States.

THE GREEN CORN PATENTS.—RUFUS K. SEWELL, ADMINISTRATOR OF HENRY CLARK, DECEASED, APPELLANT, *vs.* JOHN WINSLOW JONES *et al.*—APPEAL FROM THE CIRCUIT COURT OF THE UNITED STATES FOR THE DISTRICT OF MAINE.—OCTOBER, 1875.

To entitle a plaintiff to recover for the violation of a patent, he must be the original inventor, not only in relation to the United States, but to other parts of the world. Even if the plaintiff did not know that the discovery had been made before, still he cannot recover if it has been in use or described in public prints, and if he be not, in truth, the original inventor.

To constitute an infringement, the thing used by the defendant must be such as to substantially embody the patentee's mode of operation, and thereby to obtain the same kind of result as was reached by his invention. It is not necessary that the defendant should employ the plaintiff's invention to as good advantage as he employed it, or that the result should be the same in degree, but it must be the same in kind.

To infringe a patent, it is not necessary that the thing patented should be adopted in every particular. If the patent is adopted substantially by the defendants, they are guilty of infringement.

In an action for infringement, the first question is whether the machine used by the defendant is substantially in its principle and mode of operation like the plaintiff's. If so, it is an infringement of it.

If he has taken the same plan and applied it to the same purpose, notwithstanding he may have varied the process of the application, his manufacture will be substantially identical with that of the patentee.

The question of infringement depends upon whether the plan which the defendant has employed is in substance the same as the plaintiff's, and whether all the differences which have been introduced are not differences in circumstances not material, and whether it is not in substance and effect a colorable evasion of the plaintiff's patent.

When a party has invented some mode of carrying into effect a law of natural science, or a rule of practice, it is the application of that law or rule which constitutes the peculiar feature of the invention. He is entitled to protect himself from all other modes of making the same application, and every question of infringement will present the question whether the different mode, be it better or worse, is, in substance, an application of the same principle.

When the inventor says: "I recommend the following method," he does not thereby constitute such method a portion of his patent.

Appert's process, embodied in the Durand patent of 1810, contains everything of value that is contained in Winslow's patent, through whom the appellees claim.

Mr. Justice HUNT delivered the opinion of the court:

Jones, as assignee of four several patents for a new and useful improvement in preserving Indian corn, brought his action against Clark, the original defendant, alleging infringements of the same. These patents were issued to Isaac Winslow, and were as follows, namely: No. 34,928, dated April 8, 1862, for "a new and useful improvement in preserving Indian corn;" No. 35,274, dated May 13, 1862, "for a new and useful improvement in preserving green corn;" No. 35,346, dated May 20, 1862; and No. 36,326, dated August 26, 1862.

The two patents last above mentioned were declared and adjudged by the court below to be void, and from this judgment no appeal has been taken. They are no longer elements in the case before us, and are dismissed from further consideration.

The patent first mentioned is for an article of manufacture—a result. The second one is for a process by which a result is obtained. The first is the more full, and embraces all that is contained in the second.

The first objection made to the patents is the want of novelty. It is contended that they were anticipated by the Appert process embodied in the Durand patent of 1810; also by the patent of Gunther, of 1841, and by that of Wertheimer, of 1842. It is an elementary proposition in patent law that, to entitle a plaintiff to recover for the violation of a patent, he must be the original inventor, not only in relation to the United States, but to other parts of the world. Even if the plaintiff did not know that the discovery had been made before, still he cannot recover if it has been in use or described in public prints, and if he be not in truth the original inventor. (Dawson *vs.* Follen, 2 Wash., C. C., 311, Bedford *vs.* Hunt, 1 Mason, 302.)

Durand's patent is described in his specification, enrolled in the English Court of Chancery, as based "upon an invention communicated to him by a certain foreigner, residing abroad, of the manner of preserving animal food, vegetable food, and other perishable articles a long time from perishing or becoming useless."

In describing the nature of the invention, and the manner in which the same is to be performed, he says:

1. "I place the said food or articles in bottles of glass, pottery, tin, or other metals or fit materials, and I close the aperture so as completely to cut off or exclude all communication with the external air," and he describes the various means of effecting that purpose.

2. "When the vessels are thus charged and well closed, I place them in a boiler, each separately surrounded with straw or wrapped in a coarse cloth, or otherwise defended from striking against each other. I fill the boiler so as to cover the vessels with cold water, which I gradually heat to boiling, and continue the ebullition for a certain time, which must depend upon the nature of the substances included in the vessels, and the size of the vessels, and other obvious circumstances, which will be readily apprehended by the operator. Vegetable substances are to be put into the vessel in a raw or crude state, and animal substances partly or half cooked, although these may also be put in raw."

The specification then declares that the inventor did avail himself of the application of heat by placing the vessel in an oven, stove, steam bath, or other fit situation for gradually and uniformly raising the temperature and suffering it to cool again, and that as the choice of the consumer, or nature of the said food or other articles, may render preferable, leave the aperture of the vessel, or a small portion thereof, open until the effect of the heat shall have taken place, at which period the same is to be closed.

The points following are embraced in this patent:

1. It is for the purpose of preserving for a long time animal or vegetable food.

2. The articles thus to be preserved are to be placed in tin or other vessels, so arranged as to exclude communication with the external air.

3. An aperture may be left in the vessel, at the choice of the operator, until the effect of the heat shall have taken place, when it is to be closed.

4. The vessels, thus prepared, are placed in a boiler filled with cold water, which is heated to a boiling point, which boiling shall be continued for such time as shall be required by the substances contained in the vessels.

5. Although a water bath is preferred, the inventor declares he avails himself of heat through an oven, stove, steam bath, or any other situation fit for gradually raising the temperature and suffering it to cool again.

6. Vegetables are to be put into the vessels in a raw or crude state; animal substances, raw or partly cooked.

7. The invention is general in its terms, embracing all vegetables and all animal substances capable of being thus dealt with.

Winslow's patent of April 8, 1862, No. 34,928, is declared to be for an improvement in preserving Indian corn in the green state.

The letters patent declare that the first success of the inventor was obtained by the following process:

"The kernels being removed from the cob were immediately packed in cans hermetically sealed, so as to prevent the escape of the natural aroma of the corn or the evaporation of the milk or other juices of the same. I then submitted the sealed cans and their contents to boiling or steam heat for about four hours. * * * By this method of cooking green corn in the vapor of its juices the ends of the cans are bulged out. Strong cans are required, and dealers are likely to be prejudiced against corn thus put up. I recommend the following method: Select a superior quality of green corn in the natural state, remove the kernels from the cob by means of a curved and gaged knife, or other suitable means. Then pack in cans, hermetically seal the cans, expose them to steam or boiling heat for about an hour and a half, then puncture, seal while hot, and continue the heat for about two hours and a half."

At the close, the inventor says that what he claims to secure by the patent is the new article of manufacture, namely, Indian corn preserved in the green state without drying, the kernels being removed from the cob, hermetically sealed, and heated, as described.

Let us now state the points embraced in this the plaintiff's patent, and compare them with the points heretofore stated as included in the Durand patent.

1. Winslow's declared object is the preservation of Indian corn in the green state.

Durand's is for preserving Indian corn not only, but all vegetable substances in their raw or crude state.

2. Winslow recommends removing the kernels from the cob before the process of preservation is commenced, placing the kernels in cans, sealing them, and exposing them to heat.

Durand, not limiting himself to the article of corn, provides that the articles to be preserved shall be placed in cans, and subjected to heat in the same manner. He does not stipulate or recommend that the article shall be first removed from the cob, the vine, the twig, or whatever may be the natural support of the vegetable to be preserved, as the corn from the cob, the pea from its pod, the grape or tomato from its vine, the peach from its stem, the berry from its stalk. Neither does he recommend that it shall not be so removed. His process embraces the article in whatever form it may be presented. It is for the preservation of raw or crude or uncooked vegetables in whatever form they may be presented, and necessarily includes a case where they have been previously removed from their natural support. A prior removal from the stalk would be the natural, and, in many cases, a necessary proceeding.

3. Winslow directs that the kernels shall be subjected to the heat for a period of about one and a half hours before puncturing, and for about two and a half hours after the puncturing. The double use of the word "about" indicates that the time is not to be considered as precisely specified.

Durand directs that the boiling shall continue for such length of time as shall be required by the particular substances contained in the vessel. Corn, peas, tomatoes, peaches, berries, asparagus, may very likely require great difference in the time in which the heat shall be applied to produce the required effect. In each case that is to be the measure of the time.

4. Winslow says other modes may be adopted so long as hermetical sealing and the use of heat are so managed as to secure the aroma and fresh flavor and prevent putrefaction.

Durand declares that he intends to include in his patent heat through an oven, stove, steam, or any other situation by which the temperature is gradually raised and suffered to cool again.

The same idea is put forth at the close of Winslow's specification, where he declares that what he claims by his patent is the manufacture of Indian corn in its green state, the kernels being removed from the cob, hermetically sealed, and heated.

We are of the opinion that the substance of all that is found in Winslow's patent had, nearly a half a century before he obtained his patent, been put forth in Durand's patent. If Durand's patent were now in force in this country, and a suit brought upon it against Jones, the claimant under Winslow, for an infringement, the right to recover could not be resisted. Durand would show a patent intended to effect the same purpose, to wit, the preservation of vegetables for a long time, employing the same process, to wit, the effect of heat upon vegetables placed in a metallic vessel, the gradual cooling of the same, hermetically sealed after puncture to allow the escape of gases. This is also Winslow's process.

To constitute an infringement, the thing used by the defendant must be such as substantially to embody the patentee's mode of operation, and thereby to attain the same kind of result as was reached by his invention. It is not necessary that the defendant should employ the plaintiff's invention to as good advantage as he employed it, or that the result should be the same in degree, but it must be the same in kind. (Winans *vs.* Denmead, 15 How., 330.)

To infringe a patent it is not necessary that the thing patented should be adopted in every particular. If the patent is adopted substantially by the defendants they are guilty of infringement. (Root *vs.* Ball. 4 McLean, 177; Alden *vs.* Deney, 1 Story, C. C. R., 336.)

In an action for infringement the first question is whether the machine used by the defendant is substantially in its principle and mode of operation like the plaintiff's. If so, it is an infringement to use it. (Howe *vs.* Abbott, 2 Story C. C.; 190, Parker *vs.* Haunth, 4 McLean, 370.)

If he has taken the same plan and applied it to the same purpose, notwithstanding he may have varied the process of the application, his manufacture will be substantially identical with that of the patentee. (Curtis, § 312.)

The discovery in question has been of immense benefit to mankind. By means of food preserved in a compact and nutritious form, protected from its natural tendency to decay, deserts are traversed, seas navigated, distant regions explored. It is less brilliant, but more useful than all the inventions for the destruction of the human race that have ever been known. It is to France that the honor of this discovery belongs, and to Appert, a French citizen. It does not belong to America or to Winslow. Appert's process presents all that we now know upon the subject. It contains absolutely everything of value that is contained in Winslow's patent.

Other grave questions are presented by the record before us. We are satisfied, however, to place our decision upon the ground that the want of novelty in the patents of Winslow is fatal to the plaintiff's right of recovery. We do not discuss the other questions.

The decree of the court below must be reversed, and judgment ordered in favor of the defendant below.

NEW BOOKS AND PUBLICATIONS.

REPORT ON THE COMPRESSIVE STRENGTH, SPECIFIC GRAVITY, AND RATIO OF ABSORPTION OF THE BUILDING STONES IN THE UNITED STATES. By O. A. Gillmore, Lieutenant-Colonel of the Corps of Engineers, Author of "A Treatise on Limes, Cements, etc." New York city: D. Van Nostrand, 23 Murray and 27 Warren streets.

This book contains Lieutenant-Colonel Gillmore's official report, to the Chief of Engineers of the United States Army, on a series of tests which were partly reported on to the end of July, 1874. The present volume carries the investigation one year further, and gives some very valuable and interesting facts and information, which, taking into consideration the rapid growth of the use of artificial stone, is of the highest practical importance.

DIGEST OF OPINIONS OF THE JUDGE ADVOCATE GENERAL OF THE ARMY, containing a Selection of Official Opinions furnished between September, 1862, and July, 1868. Edited by Major W. Winthrop, Judge Advocate. Washington, D. C.: Government Printing Office.

The scope of this work is fully set forth in its title, and it will be found a useful reference book by the legal profession.

REPORT ON THE HYGIENE OF THE UNITED STATES ARMY, with Descriptions of Military Posts. Washington, D. C.: Government Printing Office.

A voluminous document, containing information down to the end of the year 1874.

JAMES W. TUFTS' CATALOGUE OF SODA WATER APPARATUS. Boston, Mass.

A handsome volume, superbly illustrated.

DYNAMOMETER EXPERIMENTS ON SPINNING FLAX. By E. Cornut, Chief Engineer of the Association of Steam Power Proprietors of Northern France. Lille, France: L. Danel.

An interesting little treatise, of great practical value.

Recent American and Foreign Patents.

NEW MECHANICAL AND ENGINEERING INVENTIONS.

IMPROVED STOPPING MECHANISM FOR SPINNING JACKS.

William W. Sinclair and Edward Galvin, Mottville, N. Y.—This invention consists of automatic mechanism for throwing off the driving belt of a spinning jack in case the squaring band breaks or fails to act. The shifter lever has a strong spring attached to it for throwing it when released by the failure of the squaring band. The said spring is held distended, ready for action, by the shifter lever itself, which is lodged in a notch in a frame piece, and is tripped by a sliding cam rod when the band fails, and throws the belt shifter.

IMPROVED WIND POWER.

Timothy C. Guthery, Freedom, Ind.—This invention relates to an improvement upon the wind wheel covered by patent No. 91,457, and consists in mounting the wheel upon a shaft having its bearings in a rotating bar, to whose upper end a vane is rigidly attached. The object is to render the device simpler and less expensive.

IMPROVED AUTOMATIC WASTE PIPE CLOSING ATTACHMENT.

F. Philip Bourne, Brooklyn, N. Y.—The object of this invention is to furnish an improved attachment for waste pipes, so constructed as to prevent the escape of gases, odors, etc.; and it consists in the combination of a valve chamber or box, bottom plate, chambered top plate, pipes, pivoted valve, pivoted valve plate, and weight with each other, so arranged as, when the waste water is admitted into the pipe in sufficient quantity to overbalance the downward pressure of the weight, the valve will be lowered into an inclined position, allowing the waste water to flow into the pipe. As soon as so much of the water has run out that the weight of that remaining will be overbalanced by the weight, the valve will close. The valve will always have a small quantity of water above it, and will thus effectually prevent the escape of any gas or odor from the waste pipe.

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IMPROVED ANTI-FRICTION BEARING.

Cevedra B. Sheldon, New York city.—Good results have lately been obtained with linings for journal boxes, composed of paper and cloth combined with plumbago. Mr. Sheldon's invention proceeds a step further, and obviates the objection of destructibility, which applies to the fragile materials last named above. Plumbago is made into a plastic mass with a suitable cement, and by heavy pressure is forced into the interstices of wire cloth or perforated metal sheets.

IMPROVED TWEER.

Charles M. Morgan, Hesper, Iowa.—The manner of controlling the blast is by raising or lowering a cup, thereby increasing or diminishing the opening for admitting the wind to the fire. Another purpose of the cup is that, by raising or lowering, it loosens the cinders that may have choked up the wind passage to the fire, and causes all fine particles to fall into the chamber below, thereby insuring a clear fire free from dirt. By operating a lever, the valve in the base plate can be moved away from its seat, to allow any dust or cinders that may be in the wind chamber to drop out; and by leaving said valve open when the blast is shut off, a sufficient quantity of air will pass up to keep the fire alive for a long time.

IMPROVED MACHINE FOR POINTING WIRE.

Henry A. Williams, West Medway, Mass—This invention consists of progressive feeding and turning mechanism, in combination with rolls having tapered grooves, for tapering and pointing wires to make picker teeth, hackle pins, printers' bodkins, taper dowel pins, and the like, the said feed mechanism being so that only a small portion of the wire is at first presented to the rolls. The wire is advanced a little more at each operation, so that, as the size is reduced, the wire feeds into the smaller portion of the grooves, and thus can be reduced to any required size in one groove. This plan saves the necessity of a series of grooves for doing the same work, also the shifting of the work from one groove to another.

IMPROVED EMERY WHEEL.

George H. Peabody, Brooklyn, N. Y.—This wheel is covered with an emery composition formed of powdered rosin, white lead, beach clay, glue, emery, and water, which is applied by tamping it to the surface of the wheel by numerous blows with a small hammer.

IMPROVED GRAIN SEPARATOR.

Michael Laufenburg, San Francisco, Cal., assignor to Treadwell & Co., same place.—A fan blower throws a blast between two separate belts. The upper half of the carrier passes over and under guide rolls at different elevations, so that the straw is shaken repeatedly on the open work belt and the remaining grain caused to fall on a subjacent chute. From this chute the grain is dropped in front of another fan that detaches any dust, and thence into a shaking shoe. By this organization of mechanism the straw undergoes such a thorough sifting that no grain that has been loosened from the head can well be carried off to the stack.

IMPROVED TREADLE.

Henry Reese, Baltimore, Md.—The object of this invention is to lessen the fatigue of operating sewing machines and other devices run by treadle power, by means of a peculiar construction of treadle which prevents the movement of the latter to be made without bending the ancles, and enables the operator to run the machine with a very light expenditure of muscular power. This result is accomplished by a peculiar construction of two independent treadles, hinged or pivoted upon opposite sides of the fulcrum of the main treadle, held in proper horizontal position by means of springs, and arranged adjustably for either foot foremost.

IMPROVED RAILWAY SIGNAL.

Jacob D. Hughson, Prairie City, Ill.—This invention relates to a signal apparatus in which springs, or other analogous means of retracting the bell clapper or hammer, are dispensed with, and two clappers or hammers are so arranged and connected with other parts that they counterbalance each other, to a certain extent, and the rebound of either aids in producing the striking movement of the other: also whereby the signal is always repeated and the sound thus made practically continuous so long as a train is passing.

IMPROVED BALING PRESS.

Christopher C. Campbell, East Chatham, N. Y., and Henry W. King and Allan C. Smith, Canaan, N. Y.—This invention relates to certain improvements in perpetual baling presses, or presses in which the operations of packing the hay into the box and tying it into bales in the baling chamber are performed at the same time; and both followers are detachable, each being taken out successively at the end of the baling chamber and inserted successively in the packing box. The invention consists in the devices for packing the hay or other material in the packing box, which devices are also made to automatically withdraw the follower from the baling chamber and insert it in the packing chamber without handling.

NEW AGRICULTURAL INVENTIONS.

CUTTER BAR FOR REAPERS AND MOWERS.

Thomas Henderson, Black Horse, Md.—The object of this invention is to provide an improved means of attaching the knives of a reaper or mower to the reciprocating bar, whereby the said knives may be more conveniently and safely handled and more readily sharpened. It consists in attaching each alternate knife to a separate bar and then placing and fastening the two bars together so as to form a continuous saw-shaped or serrated cutting edge.

IMPROVED GRATED ENTRANCE TO BEEHIVES.

John S. Harbison, San Diego, Cal., assignor to himself and Andrew Harbison, Newcastle, Pa.—This invention consists of positive gaged passages, of sufficient thickness to permit the rounding of the corners, thereby enabling the bees to pass safely with their loads of pollen, while at the same time gaging the passages to the size of the worker bees. The object is to restrain either the queen or drones from leaving their respective apartments, either in the act of swarming or otherwise.

IMPROVED ROAD SCRAPER.

William H. Bowman, London, O.—A revolving scraper is pivoted to a handle frame, which has an independently swinging front bail that breaks, by a curved end at one side only, the connection of scraper and handles. This is done by pressing on a sliding spring rod and releasing the retaining latches of the scraper. The catches are jointly operated by their fulcrumed connecting lever rods, and lock into a notched casting at each corner of the scraper. The face plates of the handles are recessed to receive the sliding rods which operate the lower catches.

IMPROVED MILK AND CHEESE PAN.

Henry W. Horton, Binghamton, N. Y.—This pan is seated in another receptacle, into which steam is admitted for heating or water for cooling. The novel features are an overflow pipe having a detachable upper portion, to allow access to a series of inlets, through any one of which the water can be made to escape by plugging the passages below. The end pieces of the supporting frames are made in sections, so fitted together that any number of the sections can be put in to make them of any length required for pans of any width.

IMPROVED TOBACCO SUCKER GERM DESTROYER.

Joseph H. Knaus and John R. Harford, New Franklin, Mo.—In using the instrument, the fork of a bar is placed against the tobacco stalk, directly over the sucker germ, and is pressed against said stalk with sufficient force to force the forked bar upward and cause a cutter to project against said germ. A cross bar is then drawn upward with the fingers, which rotates the rod and cutter, and cuts out and destroys the germ, so that it will not grow again.

IMPROVED HAY RACK.

Joseph Hall, Riverside, Neb.—This invention consists of improvements in parts of the hay rack for which a patent was granted to the same inventor, May 1, 1875: said improvements being hook bolts instead of hooks, and other devices, the general end of which is to render the apparatus more substantial.

IMPROVED CHEESE TURNER.

Charles Barlow, Cookshire, Canada.—This invention allows the cheeses to be turned and greased without removing them from the shelves; and the general arrangement is such that each shelf may be readily brought into such position that the cheeses upon it may be conveniently reached.

IMPROVED GRAIN BAG.

Constantin Lazarevitch, Brooklyn, N. Y.—In this improved grain bag, the necessity of sewing up the mouth of the grain bag is obviated. A funnel-shaped part is formed above the mouth of the bag, the mouth being made narrower by closed shoulders on each side of the funnel. The funnel is reversed and forced into the grain, closing thereby the bag securely.

NEW TEXTILE MACHINERY.

IMPROVED FELTING MACHINE.

Jeremiah J. O'Sullivan, Brooklyn, N. Y.—By this invention the inventor claims to dispense with putting in layers, breaking down, stopping off, hardening off, tip-hardening, and all other handling usual in the old process of hat-hardening. The process is as follows: First, having raised the upper cone from the perforated cone, the hat body is placed over the latter. The upper cone being set in position, steam is admitted to the perforated cone. This heats and moistens the hat body; and while this is going on, the upper cone is given a rapid reciprocating motion. The cones, being perfectly true, will cause the whole hat to be finished with an evenness heretofore unable to be obtained.

NEW WOODWORKING AND HOUSE AND CARRIAGE BUILDING INVENTIONS.

IMPROVED VEHICLE TOP PROP BLOCK.

Andrew Butterfield, Huntsville, Ala., assignor to himself and I. I. McKibbin, of same place.—This inventor proposes a spring extension of the block up along the bow, and a cushion on the end for the bow to rest on, whereby the spring extension takes the strain off the bows when the top is down, and prevents them from springing and breaking. The top is also preserved, and has an easy and graceful vibrating motion.

BRACKET BAND FOR VEHICLE WHEELS.

John G. Lefler, Philadelphia, Pa.—The object of this invention is to provide a ready means for repairing the hubs of vehicle wheels by strengthening the connection between the hub and spokes. The invention may also be applied to advantage in new wheels for additional strength; and it consists in a bracket band, or a band which is made to encompass the hub, with bracket extension for each spoke provided with a screw eye or bolt hole, so that when the spoke is inserted in its socket and fastened by a bolt or screw to the bracket extension, it is securely held to the hub against all shrinkage, wear, and rattling.

NEW CHEMICAL AND MISCELLANEOUS INVENTIONS.

IMPROVED BAGGAGE CHECK.

John F. Wheeler and Henry A. De Haven, San Quentin, Cal.—In this improved baggage check a duplicate is taken off from and applied in an instant to the main check, and is carried about by the checker. The slotted main check is attached, by a belt and tag, to the trunk. A spring around the eye of the slot retains the tag, and serves also to lock the duplicate check that slides, by a projecting stud and fastening knob, in the slot of the main check.

IMPROVED LOCOMOTIVE HEAD LIGHT.

William P. Mills, Frank Bell, and James Carey, Jackson, Mich.—This invention consists of side openings through the reflector and the case of the ordinary head light, together with contrivances for setting in different glasses for train signals, [illegible] used instead of the colored lanterns now specially used on trains for that purpose, and thus, by making the head light do the duty of the signal lanterns, save the cost and attendance of them. The inventor claims that the head light affords greater certainty, because it is less liable to go out; and if it does, it is where it will be noticed at once by the engineer, whereas the location of the lanterns used is such that they are not always in view, and at best they are more uncertain as to burning than the head lights are.

IMPROVED CAN-SEALING DEVICE.

Richard Wells, Baltimore, Md.—This invention relates to certain improvements in that class of devices for sealing cans, in which the air is first exhausted by mechanical means, and the can then hermetically sealed. It consists in a plug of metal or other suitable material, screw-threaded so as to be securely and permanently located in the cork stopper or cover of the can. The said plug is hollow, and is also screw-threaded upon its inner surface, into which an interior plug carrying an elastic stopper is secured. This interior plug is provided with side grooves for the escape of the air, and has a squared recess in its top to receive the end of a wrench or turning shaft, which passes through a detachable chamber having communication with the exhausting apparatus.

IMPROVED GUN WIPER.

Evander M. Gregg, Mars Bluff, Ky.—The invention relates to means for swabbing out a gun barrel so as to conveniently liberate the adhering matter on the inside, and consists in a piece of metal having at one end a socket, into which is screwed a bolt, between whose head and a flange are arranged a series of rubber disks with spaces and washers between them. The attachment has also at the upper end a socket in which is secured the small end of the ramrod. The disks can be expressed outwardly so as to form a larger circumference, by merely screwing up the bolt, while, by removing the latter, the disks and washers may both be changed.

IMPROVED LAMP EXTINGUISHER.

Charles J. Knapp, 48 Beekman street, New York city.—This is an ingenious and practical extinguisher for kerosene lamps, claimed to obviate the dangers that attend blowing out either up or down through the chimney. It is applicable to any of the burners now made, and appears to be an improvement of merit. Standards are applied to the narrow sides of the wick tube, and provided at the upper ends with pivoted caps that are operated to close over the wick tube, or are opened by a forked and weighted lever with cap connecting links. The caps, when closed above the wick tube, extinguish the flame.

IMPROVED BIRD CAGE.

Robert C. Breck, Bridgwater, Mass.—Two compartments are made in the cage to receive the food and water vessels. When the food or water is to be replenished, the outer door of the compartments is raised until caught and held by a catch. This leaves the inner door closed, and the outer side of the compartment open, so that the food or water can be put in or taken out, or the compartment cleaned, without any danger of the bird getting out. Triangular plates are pivoted at their angles to the bars of the cage at the upper and lower ends of an opening. The sides of the plates, adjacent to the pivoted angles, are connected by wires, and to the lower plate are attached pins to receive fruit or other articles for the bird to eat. This device may be turned out so that the pins will be without the cage, when fruit may be placed upon them; and when the device is turned inward, the pins will be within the cage, so that the bird can conveniently reach them while standing upon the perch.

IMPROVED SPRING BALANCE FOR EXTENSION CHANDELIERS.

Lyman T. Lawton, West Meriden, Conn., assignor to himself, P. J. Clark, and Joseph Kintz, of same place.—This is a spring top in the bottom of the case of a spring drum, in combination with notches in the drum, and having a cord depending from it, all so contrived that the stop will be caused to engage the drum by its spring, to hold it so as to prevent a heavy chandelier from falling or a light one from rising. It can be readily pulled out of the notches by the cord, to allow of adjusting the chandelier.

IMPROVED BROOM-SEWING MACHINE.

Henry Behren, Columbus, Ohio.—In this machine the jaws may be readily thrown into position for sewing the different seams, and may be opened for taking out the work without requiring the troublesome changing of the pins of different lengths that have to be changed after each seam. To this end jaws are provided with pivoted pawls that lock into racks and notched plates at the sides of the machine.

IMPROVED GALLEY SUPPORTER.

William S. B. King, Brooklyn, E. D., N. Y.—This is an improved device for supporting a galley upon a compositor's case while correcting, so that access to all the type boxes is always free. An illustrated description of the invention will be found on page 402, volume XXXIII.

IMPROVED STUD AND BUTTON.

John B. Bennett and Walter Bennett, Halifax, N. S.—This stud has a head having a recess in its under side; a stem, provided with a pin attached to said head; and a back disk provided with a tube having a horizontal flange on its upper end, which enters the recess in the button head. The flange and tube are slotted for the reception of the pin on the stem, which serves to lock the two parts together.

IMPROVED OIL-BURNING STOVE.

Edwin G. Adams, Cohoes, N. Y.—This stove includes devices whereby oil is forced out of its reservoir and to the surface of water where it is burned. The dampers may be adjusted to leave any desired amount of fire surface.

IMPROVED CAROUSAL OR ROUNDABOUT.

Robert Steel, Philadelphia, Pa.—This is an improved device intended to take the place of the horse carousals or roundabouts now in use in parks and other places of amusement for children to ride upon. It consists in the combination of a rigged vessel with a revolving wheel and its driving mechanism, so that it travels over a cloth painted to represent waves.

IMPROVED HEAT INDICATOR FOR STOVES.

Alfred J. Jourde, St. Louis, Mo.—This invention relates to a thermometer attached to a stove for indicating the inside temperature of the same, so as to admit the proper regulation of the heat, produce a saving of fuel, and indicate also the proper heat for cooking and baking. The instrument is screwed, by a threaded tube of the graduated plate, back of the mercury, into a hole of the stove, and retained by projecting seats at suitable distance from the same.

IMPROVED COMB.

John T. O'Donoghue, New York city.—This is a comb, of metal or any suitable substance, having a hollow head, in which a heating iron of the handle is placed for heating the comb and keeping it warm while using it. By the use of a heated comb, the heat, it is claimed, draws the sap and oil from the scalp into the hair, and thus restores color, vitality, and vigor.

IMPROVED TRUNK.

William J. Large, Brooklyn, N. Y.—This is a new arrargement of two trays, which are so connected by hinges that the upper tray may be conveniently turned up to allow of access to the lower one. New devices are also provided for holding the trays in place.

IMPROVED ICE CREAM FREEZER.

Sylvain M. Gosson, Whistler, Ala.—This ice cream freezer will enable ice cream of any desired number of different flavors to be kept distinct and separate while being frozen. It combines several novelties in mechanical construction, the principal of which is a ring can divided into compartments, in which buckets holding the material to be frozen are placed.

MANUFACTURE OF ANTIQUE COLORED GLASS.

James Baker, New York city.—By this method of turning or spinning the fused glass of any color or tint into disk or oval shape, concentric streaks are formed around the bull's eye at the issuing orifice of the rod, while at the same time different shades are formed by the slightly diminishing thickness of the glass disk from the center toward the circumference. This admits of bringing a certain shading into the glass pieces employed. The peculiar concentric structure of the glass disk produces a brilliant sparkle and semi-translucent effect, which approaches the warm and effective coloring of antique glass, and furnishes thereby colored glass of superior quality for church windows and other ornamental purposes.

IMPROVED POCKET BOOK FASTENERS.

Daniel M. Read, New York city.—This inventor has patented two ingenious devices for securing the flaps of pocket books. The first comprises a spring-pressed sliding catch bar, a series of ratchet teeth formed on a slotted base plate, and a catch pin engaging with the ratchet teeth. The book may by this be drawn snugly together without withdrawing the catch from the lock; and the outer surface of the lock appears entirely smooth, and without any projecting knob or handle. The second device consists essentially in the provision of a pivoted spring pressed cap or catch retaining plate, which is extended in rear of its pivot, so that it can be operated by the thumb or finger to release the catch on the flap from the fastening on the body of the pocket book. With this construction, the fastener may be unfastened with gloved hands without inconvenience, and without injuring the gloves.

IMPROVED MINERS' LAMP.

James C. Marshall, Girardville, Pa.—This invention consists of a spring, in combination with the hook by which the lamp is hooked to the hat. The spring holds a fold of the hat between it and the hook, and thus sustains the lamp when the miner is at work.

IMPROVED SYRINGE.

Charles E. Koechling, New York city.—This syringe is provided with a conical stopper of elastic material back of the nozzle, adapted and fitted for insertion in a bottle, so that it may be directly filled from the latter.

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Business and Personal.

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One 12 in. Mill Saw File of our manufacture filed 70 Gang Saws at McGraw & Co.'s Saw Mill (the largest in America), Bay City, Michigan. Passaic File Works, Paterson, New Jersey.

An Interest in Sewer Trap, described on page 118 of this paper, will be sold to a Capitalist or good Manufacturing Co. Address J. T. Campbell, 1284 Broadway.

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L. Duvinage, 1745 N. 11th St., Philadelphia, Pa., will act as Agent, erect Machinery at the Centennial Exhibition, and make drawings.

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Hand Fire Engines, Lift and Force Pumps for fire and all other purposes. Address Rumsey & Co., Seneca Falls, N. Y., U. S. A.

Roth's Saw File Guide, illustrated in this paper Jan. 1, 1876, is manufactured by E. Roth & Bro., New Oxford, Pa. One, as sample, $2. Agents wanted.

Wanted—A Bone Crusher, suitable for crushing bones size of nut coal. A stamp mill preferred. P. O. Box 3369, Boston.

½, 1, & 2 Horse Engines, $30, 60, & $100; Boilers for same, $75 & $100. T. B. Jeffery, 253 Canal St, Chicago.

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Notes & Queries

T. A. B. and others, who ask as to books on the locomotive engine, should read Forney's "Catechism of the Locomotive."—D. W. P. will find formulæ on the strength of boilers on p. 186, vol 32.—J. C. W. will find full instructions for polishing lenses on p. 363, vol. 31. Consult Prechtl's "Dioptrik," if you can read German.—J. H. R. should use the Léclanché battery. See p. 362, vol. 31.—P. H. G. will find directions for polishing shirt bosoms on p. 203, vol. 31.—H. H. T. will find particulars as to the invention of the screw propeller on pp. 151, 241, vol. 30.—E. R. J. will find a description of the method of preparing bone charcoal on p. 54, vol. 28.—J. L. H. will find a recipe for cement for glass and brass on p. 117, vol. 32.—F. B. S. will find a description of an electric engine on p. 241, vol. 33.—A. K. will find full directions for mounting maps, etc., on p. 91, vol. 31.—R. W. will find that painting on zinc is described on p. 116, *Science Record* for 1874.—W. N. C. will find directions for bluing steel work on p. 123, vol. 31.—W. A. will find directions for hardening needles on p. 347, vol. 31.—J. C. R. will find the dimensions of the Great Eastern steamship on p. 346, vol. 31.—J. C., of Moscow, Russia, will find a description of a wood-splitting machine on p. 79, vol. 28.

(1) S. L. S. asks: Please to inform me how I can dissolve aniline green, or how to prepare it for coloring purposes. A. We are acquainted with two varieties of this color, namely, aldehyde green and iodine green. The former is soluble in 2 parts of sulphuric acid, and from 50 to 70 parts of alcohol. The latter dissolves readily in equal parts of alcohol and water.

(2) W. M. J. asks: 1. Why would it not answer as well to place the coils of a magnet $\frac{1}{16}$ of an inch apart instead of putting them the thickness of a fine silk thread apart? What would be the result provided the same length of wire be used? A. It would not answer so well, because the same number of convolutions could not be contained in the space occupied by the wire when the latter is covered with a thin layer of silk only. 2. What is the theory of a current of electricity, passing around a piece of soft iron, magnetizing the same? A. Ampère's theory assumes that each individual molecule of a magnetic substance is traversed by a closed electric current. It is further assumed that these molecular currents are free to move about their center of gravity. The coercive force, however, tends to keep them in any position in which they may happen to be. When a current of electricity is passed around the substance, its tendency is to place all of the molecular currents in a parallel direction; by this means the action of the latter on external matter becomes apparent. 3. Is the magnetic influence derived from the passage of a current of electricity? A. Yes. 4. Would it not do as well, if practicable, to replace electricity with heat? A. Yes. It is not practicable, however, until the heat is first transformed into electricity.

(3) J. R. C. asks: If the two disks of an achromatic object glass are $5\frac{3}{16}$ inches in diameter, the bi-convex and the contact side of flint glass being ground to 31 inches radius, what should be the curvature of the posterior side of the flint glass? If the disks be 4¼ inches in diameter, and the three curves (as above) are ground to 24 inches radius, what should be the posterior or correction curve? The lenses are of French glass. A. Assuming the glass to be of medium quality, in the first instance, the posterior curve should be concave, of 146 inches radius. The latter should also be concave, of 113 inches radius.

(4) J. E asks: How can I make glycerin soap? A. It is made by incorporating, with any mild toilet soap, $\frac{1}{25}$ or $\frac{1}{50}$ by weight of pure glycerin, while in the melted state. It is generally tinged of a red or rose color with a little tincture of orchil or of dragon's blood, or orange yellow with a little annatto. It is variously scented; but oil of bergamot or rose geranium (ginger grass) supported with a little oil of cassia, or oil of cassia supported with essential oil of almonds, appears to be the favorite perfume. The greater portion of the so-called glycerin soaps contain not a particle of glycerin.

(5) J. F. P. says: I propose to build a fruit house with ice house overhead. I propose a triple brick wall, with two air spaces of two inches each, with cut-off at every two feet in hight. Would it be better to fill one or both spaces with non-conducting material, like sawdust, or leave them as dead air spaces? A. In this case [illegible] would suffice.

(6) J. O. P. asks: How can I make vinegar in 10 hours, from pure cider? A. The best ferment is vinegar. An old cask in which vinegar has been kept is the best to ferment in. Other ferments are used, such as bread soaked in yeast, sour dough, dough of wheat, or rye bread soaked in cream of tartar and vinegar. All these are used in small quantities, a few ozs. to the barrel. Vinegar made with them is more apt to spoil. The more ferment there is present, the quicker will be the process. The cider is put into the cask, which is best painted black outside to absorb the sun's rays when the weather is cool; the bung is left out, the bung hole is covered with a piece of slate, and in about four weeks the rectification is complete. The lower the temperature is, the slower will be the change.

(7) G. J. asks: In what position is the compass placed on board iron steamers, so as not to be affected by the metal of which the ship is constructed? A. It is mounted on an elevated standard, sufficiently high to be out of the sphere of the ship's attraction.

(8) J. C. R. asks: Where is native sulphur found, outside of Sicily? A. The great depositories of sulphur are either beds of gypsum and the associate rocks, or the regions of active or extinct volcanoes. In the valleys of Noto and Mozzaro, in Sicily, at Conil, near Cadiz in Spain, at Bex in Switzerland, at Cracow in Poland, it occurs in the former situation. Near Bologna, Italy, it is found in fine crystals, imbedded in bitumen. Sicily and the neighboring volcanic isles, Solfatara near Naples, and the volcanoes of the Pacific Ocean, etc., are localities of the latter kind. It is also deposited from the hot springs of Iceland; and in Savoy, Switzerland, Hanover, and other countries, it is met with in certain metallic veins. Near Cracow and in Upper Egypt there are large deposits. A fiberous variety is found near Sienna, in Tuscany, and is abundant in the Chilian Andes.

(9) G. M. says: I wish to know something of the nature and properties of phosphorus. A. Consult some elementary work on chemistry.

1. Does lodestone possess the same properties, in every respect, as an artificial magnet? A. Yes. 2. Which is the most powerful? A. Artificial magnets are much the more powerful. 3. Where is lodestone found? A. Lodestone occurs in large quantities in the northern parts of New York State. 4. In a horseshoe magnet, made of a bar of steel 8 inches in length, how far apart should the ends be to secure the greatest power? A. About ½ inch apart.

(10) W. T. G. asks: 1. What are the qualifications necessary to become a midshipman in the United States navy? A. A fair English education, good physical development, and age between 14 and 18 years. 2. Who would be the proper person to apply to for a position in the lake squadron? A. There is no lake squadron. To become a midshipman requires recommendation to the Secretary of the Navy by the member of Congress of your district. 3. Which offers the best chance for study and advancement, the United States navy or the merchant marine? A. In the navy, you are sure to be advanced if you live long enough. In the merchant service, the case is the same as in any private pursuit; individual merit and ability tell.

(11) S. H. L. says: I have an ornamental piece of white ivory, in the shape of a cylinder, which has lately cracked. Do you know of any plastic material with which I could fill the crack, to conceal the defect, and not in any way affect the ivory? A. Place a small quantity of pure gelatin in a strong solution of alumina. When entirely penetrated by the alumina, remove from the solution, and use immediately. When dry, it may be readily polished.

(12) J. R. says: I am interested in a quartz mine, which assays from $40 to $80 per tun of gold; but the sulphuret of iron is so abundant that the quartz mill men claim that they cannot amalgamate the gold. Can you inform me of some cheap method of destroying the sulphuret of iron? A. Pulverize the ore, and roast it at a high temperature in a current of air. This will expel the sulphur as sulphurous acid gas, leaving the iron behind as an oxide.

(13) O. C. says: You say that the earth received its motion at the creation, and that motion keeps up from the fact that there is no resistance. As the moon draws after it a great tidal wave, extending nearly from pole to pole, the land must feel this draft; is not this an enormous resistances, and would it not of itself bring the earth and moon to a standstill, if there were not some great and perpetual force keeping them in motion? A. Mayer has demonstrated that the tidal wave due to the moon exerts a retarding influence on the rotation of the earth, but that, at the present period of its existence, the retardation is exactly counterbalanced by the acceleration due to its contraction in size by cooling. He holds that there will come a time when the cooling has proceeded so far that no more contraction will take place, and that then the retardation by the moon's action will commence, and go on until, in the course of ages, the earth will always turn the same side to the moon. He holds also that the moon has gone through this process.

(14) J. C. R. asks: 1. Are there any sulphur mines in the United States? A. Sulphur is found in this country near the sulphur springs of New York, Virginia, etc., sparingly, in many coal deposits and elsewhere, where sulphide of iron is undergoing decomposition, and in microscopic crystals at some of the gold mines of Virginia and North Carolina; as a powder and in crystals in the western lead regions: in cavities in the limestone, in minute crystals on cleavage surfaces of galena; and the beds of California afford large quantities of sulphur for commerce. 2. Excepting for SO_3, gunpowder, and friction matches, is there any considerable use or demand for sulphur? A. Yes, it is used in large quantities for sulphurizing hops and vines; as a preventive against some diseases of these plants, the quantity of sulphur used annually for this purpose in France, Spain, and Italy amounts to about 45,000 tuns. It is further employed in the production of sulphites and hydrosulphites, sulphide of carbon, cinnabar, mosaic gold or bisulphide of tin and other metallic sulphurets, ultramarine, various cements, and for vulcanizing and ebonizing india rubber and gutta percha.

(15) O. C. says: Suppose the continents led east and west, and the oceans extended around the globe in the same direction, with no land to check the tidal wave, what would be the result? Would not the tidal motion of the sea constantly increase, rushing like a cataract over land of an ordinary hight, and carrying everything before it? A. Undoubtedly some straits have been made, or at least their formation largely assisted, by the tidal waves. If there were no land to check the tidal wave, it would go round from east to west, and not be deviated in various directions, as is now the case. In some narrow straits it might rush, as is now the case, but not reach such a hight as to carry everything before it, the hight of the tides being due to the balanced attractions of earth, sun, and moon.

How far are the seven stars of the *Pleiades* supposed to be from each other? A. The mutual distance of the stars is on an average equal to their distance from us; there are, however, spots in the heavens where stars are fewer, and where this distance is greater; and inversely, there are some star groups where the distance is much smaller; such a group is the *Pleiades*, their material distance varying from one fiftieth to a five hundredth part of the distances from us. The telescope reveals clusters where the stars are still closer together, hundreds of them throwing a glow around like that of a furnace.

(16) J. J. asks: Do you know of any means whereby the law of gravitation can be suspended? A. This law is so universal and inherent in matter that there is absolutely no means of the kind.

(17) W. H. says: We have a reservoir on a hill which we wish to make use of for fire purposes in our mill, situated at the foot. It would be costly and inconvenient to tunnel through the side of the hill in order to lay pipe from the bottom of the reservoir to the mill, the top of which is 60 feet below the bottom of the reservoir. Could a siphon be used with advantage and certainty, so as to give us command of all the water in the reservoir in case of fire? The siphon could be sunk in the bank a few feet below the level of the water surface. If a siphon be practicable, how deep below the surface ought it be laid? The reservoir is 20 feet deep. A. The reservoir being 20 feet deep, and the highest part of the bend being a few feet below the surface of the water in the reservoir, there can be no doubt of a siphon's working well. The shortest leg of a siphon ought not to be more than 30 feet long, as the weight of the atmosphere counterbalances only from 32 to 36 feet of a column of water; but in this case your shortest leg will be not more than, say, 18 feet. The pipe should be so laid as to prevent freezing; for this purpose four feet below the surface will be deep enough; it should be also sunk in the bank down the side of the reservoir to guard against the same difficulty in case of low water. Take iron pipe and cover it with tar. 2. Is there a possibility of boring through the side of the hill to the bottom of the reservoir? A. In boring through the side of the hill, there would be danger of leakage to your reservoir, through which you might lose all of the water.

(18) C. G. W. asks: Is there any chemical that will assist a diamond in drilling hardened steel? A. Moisten the steel with a little turpentine or benzole. The latter is the better of the two.

(19) R. H. B. says: I have a tin roof put in with what tinners call standing seams. In a high wind it rumbles a good deal. Is that an ill omen? A. Tin plates for roofing are sometimes put together in the shop in rolls, taken to the building, and laid upon the roof, extending from the ridge to the eaves; the edges of the rolls are brought together, secured to the roof by nailing a cleat of tin between them, and the two edges and cleat are made into a standing joint, bent over at the top, one within the other, into what is called a double lock. By this style of roofing, the tin has quite a limited nailing to the roof boards; and should the edges become loose at any place to admit the entrance of the wind, it could very easily be stripped off by that means. This danger, provided the rolls are wide, more than compensates for any advantage it may possess in respect to its yielding, without injury, to expansion and contraction. The usual mode of laying the tin, plate by plate upon the roof, where every plate is securely nailed, has generally, we think, met every reasonable expectation in regard to durability, and is to be much preferred to the former method.

(20) S. L. T. asks: I am about building a sawmill in which I wish to run a muley saw or a 36 inch buzz saw. There are two engines in view; one has a cylinder 5 x 10 inches with a 30 inch balance wheel, the other has a cylinder 6 x 8 inches with an 8 inch balance wheel. Which in your opinion is the best for me? A. The 6 x 8 engine.

(21) W. O. P. asks: Is it practicable to melt cast iron on an ordinary blacksmith's forge, in sufficient quantity to make a casting of 15 or 20 lbs. weight? A. No.

(22) L. L. H. asks: The wild cane growing throughout many parts of our country can be utilized for making pipes for conveying water and other liquids. Some of them attain a diameter of several inches. With an iron rod heated to redness, the joints may be entirely cleaned out; and by means of large corks bored with smooth holes, they can be united in any length. By coating them with coal tar they will remain serviceable for years. Is there a way by which they may be curved or bent (and remain so) so as to suit a change of direction? A. Try steaming them, as is done for wood bending.

(23) J. A. G., of Manchester, England, asks: Can bright steel goods be hardened and tempered without affecting the polish on them? A. No.

(24) O. F. says: 1. We have a 10 by 16 inches single valve engine, of which the valve is 10¼ inches long and 5½ inches wide, with a recess in it for steam exhaust 9 inches long by 2⅝ inches wide. The entire width of valve seat is 7 inches, and the width between outside margins of steam ports is 4¾ inches, and between inside edges, 2¾ inches, the ports being consequently each 1 inch wide. The exhaust port is 1⅜ inches wide, and all are 9 inches long. The throw of the valve is 2¼ inches, the eccentric being set so as to begin to admit steam as the piston reverses its motion. The feed pipe is 2½ inches and the exhaust pipe 3 inches diameter. The engine runs at 120 revolutions per minute. Are the ports, valves, and other portions rightly proportioned? A. The cylinder exhaust port is a little too narrow, and the valve travels too little. 2. The piston does not come to within an inch of the cylinder heads. Can anything be done to economize steam and improve the working capacity of the engine? A. There is too much clearance at the ends of the stroke, to remedy which increase the thickness of the piston head or the cylinder heads. 3. The present boiler is 10 feet long and 3 feet in diameter, with 26 three inch tubes, supplemented by a heater. How much boiler room would be required to run the engine at 200 revolutions per minute, and maintain 60 lbs. pressure in boiler? A. Your boiler pressure, if increased by nearly on third, will maintain 200 revolutions.

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(25) C. G. asks: What is the proper way of packing the stuffing box around a steam engine piston rod? A. Use the ordinary small sized prepared packing, and a small packing tool.

(26) Y. L. asks: 1. When my engine is running very light, I find that, before it is necessary to replenish the furnace with fuel, it is so far burnt down that part of the fuel falls through the grates, and is thus lost. What should be done to prevent this? A. To prevent the waste of fuel referred to, put a damper to the ash pit and in the chimney. 2. Is it right, in such a case, to open the flue doors? A. Sudden drafts of cold air are injurious to the boiler. 3. Do you not think that all boilers should have a damper in the stack to regulate the draft with? A. Yes, or over the mouth of the ash pit. 4. Is it injurious to a boiler to open the fire doors in case of too much steam? A. Yes, slightly. 5. How are leaky engine cocks, such as cylinder and blow-off cocks, ground? A. The unground shoulder should be eased off with a file, and the plug ground as directed in "Wrinkles and Recipes." 6. Are hand force pumps ever used for cleaning boilers? A. Yes, but a boiler cannot be thoroughly cleaned by a force pump. 7. Does it injure a boiler to blow it out, and immediately wash it out by means of a pump with cold or luke-warm water? A. Yes. 8. When twin boilers are connected by a mud drum laid under them, into which the feed water is also forced, should the connecting pipes be large? A. Yes, the larger the better.

(27) J. E. W. says: I wish to build a foot lathe for turning ordinary light work. Of what size should the drive pulley and the small pulley be, to get the fastest motion with the least power? A. Make the treadle pulley about 30 inches, and the lathe pulley about 6 inches. 2. What should be the stroke or length of the crank? A. About 4 inches.

(28) A. M. H. asks: What will be the difference in time between two clocks having pendulums of the same length, one vibrating in an arc of 10°, the other in 11°? Both are supposed to run for 24 hours. Is there a rule for arcs of any number of degrees? A. If the vibration is less than 10°, and the pendulum is free, that is, if it has no work to do, the difference in time for different vibrations is so small that it need not be taken into account. It is advisable to have the vibration as small as possible; then the barometric change in the atmosphere has less effect upon it.

(29) F. D. and others ask as to the best possible method of arranging saw mill gearing: The method which obtains the desired speed on the saw, with the least number of gears, shafts, bearings, or pulleys, is always the best. Always get the speed as direct from the driver as possible. Every additional piece entails a loss of power in the excessive friction.—J. E. E., of Pa.

(30) B. P. F. asks: 1. Can you give me the dimensions for a drying house for lumber? A. The size of your house should conform to the dimensions and quantity of the lumber you propose to season; perhaps 20 by 35 feet and 15 feet high might answer in the absence of any particular requirements. 2. At what point or points should the steam be allowed to enter and escape? A. The steam should circulate through a coil of 1 inch iron pipe to the extent of, say, one superficial foot of heating surface to every 50 cubic feet of air in the house. Place the pipe in stacks about 25 feet long, one pipe over another, connected at the ends and graded to discharge the drip water from the top to the bottom; let the pipe from the boiler connect at the top, and another pipe return to the boiler from the bottom, of the stack; and this will keep up the circulation and return the drip water to the boiler. Provide ventilation as described in answer to G. J. P., No. 43, in this issue. 3. How long should the lumber remain in the house? A. The lumber should dry in from four to six days.

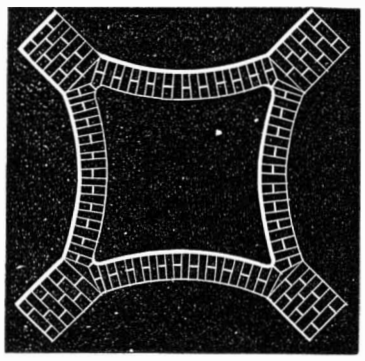
(31) J. B. Jr. asks: What shall I put on pine knots so that they will not show through, after painting the boards? A. Shellac varnish.

(32) A. S. asks: 1. Which is the best of the following two plans for heating the rooms in factories, putting the steam pipes round the rooms below the windows, or overhead, hung from the ceiling? A. Below the windows. 2. Would it take more steam to heat the rooms with the pipes hung from the ceiling than with them below the windows? A. Yes. 3. Which of these ways would be most liable to cause fire? A. Over the windows. 4. Would 2 six inch cast iron pipes heat a room with less steam than 6 one inch wrought iron pipes, on the same conditions as mentioned in question 1? A. Provide one superficial foot of heating surface in your pipes for every 70 cubic feet of air contained in your room; the one inch wrought iron pipe is the best; let the steam enter at the highest point and return at the lowest, and set the pipe in a continuously descending grade between those points, that the pipes may not be trapped with water.

(33) S. A. T. says: We have a paper mill built on a light bottom of quicksand, and within 200 feet of a hill or bluff 100 feet high. In the mill are two large tubular boilers for generating steam, using an iron stack or chimney, which is very expensive on account of its short life, and a brick chimney is out of the question on account of our sandy foundation. It occurred to us to dig a trench or ditch of suitable size from the boilers to the top of the bluff, and there build a brick chimney of proper hight, the whole to act as chimney to our boilers. Could we get a good draft in that way, and would dampness of earth affect it? A. Such a construction would be practicable, especially if lined with brick. In starting the fires, it might be necessary to build a temporary fire at the foot of the vertical portion.

(34) T. A. W. asks: Is there any means of revivifying the common hydraulic cement when once damaged? A. Yes; reburning it.

(35) J. L. C. says: I wish to build a cistern which, on account of the nature of the soil, must be built nearly all above ground. My experience is that the ordinary square walled cisterns, if above ground, are not to be depended on, and generally leak. It is not convenient for me to build a round cistern, and I have planned one, shown in the diagram, which I think will be very strong and will suit my case exactly. It is constructed on the principle of the arch, and the pressure of the water strengthens rather than weakens the walls, provided the four corners, which are supplied with buttresses, are made to bear the strain. This being so, I can save material and make the cistern walls 9 inches instead of 14 inches thick. Please give me your opinion. A. The principle is a correct one. A good foundation would be required for the whole of it, to prevent settling, which would cause cracks. Greater strength could be obtained by anchors extending diagonally from one buttress to the opposite one; these could be made of iron pipe covered with tar, and secured by means of nuts over plate washers.



(36) E. C. H. says: 1. I have some photographic lenses, double convex, of good quality: one is 2¼ inches in diameter and of 8 inches focus; the other is 1 inch in diameter and of 5 inches focus. Can I construct a telescope with them, by the addition of other glasses, if necessary? A. You cannot construct a telescope with lenses intended for photography. The simplest possible telescope consists of an object lens of very long focus, say from 20 to 40 inches, and an eye piece, which is one small lens or is compounded of two or more small lenses of very short focus, say 1 inch or less. 2. How shall I arrange them, and what other lenses would I require? A. We refer you to the first number of the SCIENTIFIC AMERICAN SUPPLEMENT, where the construction of telescopes is fully described and illustrated. 3. Can a magic lantern be made with these lenses, and how should I arrange them? A. You can make a magic lantern with them; photographic lenses are excellent for that purpose; but then you want so-called bullseye condensers, between the picture to be enlarged and the light. These bullseye lenses must be some 3 or 5 inches in diameter, and have a focus of about 6 inches.

(37) F.E.D. B. asks: How many chair rockers of a common rocking chair can be sawn in an hour with a band saw? We have a man here who says he can saw 400 in an hour. Is it possible? A. The man claims that he can saw 6⅔ pieces per second. The average length of a rocker is 2 feet, to be sawn on both edges, equal to having 13⅓ feet (lineal) per second. Probably several would be sawn through at each cut; and in most cuts, the concave part of one and the convex of the other would be made at same cut. This renders such a feat possible, and it seems no more difficult than for one circular saw to cut 9 boards 24 inches in width, 1 inch thick, and 16 feet long in one minute. This I have seen done. At this rate of sawing the incredible amount of 172,800 feet of lumber would be sawn in 10 hours.—J. E. E., of Pa.

(38) W. H. says: We want to convey about 12 horse power into a building 37 feet distant. Is there any way of making cotton rope impervious to the weather, so as to make it serve the above pose? A. We would recommend a rubber belt.

(39) I. A. M. says: 1. Of what diameter should a circular saw be for general use, more particularly on oak logs? A. From 50 to 60 inches. 2. How many horse power would be necessary to run it? A. From 15 to 30 horse power. These answers, however, depend in each case on the average size of the timber, and amount of work to be performed. As a rule, each horse power, well applied, will saw one thousand feet of lumber with a circular saw; this varies slightly with the hardness of the timber and power used. For example, it is easier to make 30,000 feet of lumber with 30 horse power than 5,000 with 5 horse power, partly owing to the greater proportionate amount of friction in the smaller power mill and other obvious causes.—J. E. E., of Pa.

(40) J. E. J. says: 1. Would an achromatic spyglass of 50 power be of any use for astronomical purposes? Would it show the globular form of the planets, and Jupiter's moons and Saturn's rings? A. Yes, if it is a good one. 2. How far could a man be seen with such a glass on a clear bright day? A. Fifteen or twenty miles.

Would it be safe for a person never having seen a course of chemical experiments to attempt to perform those given in elementary chemistry without the aid of an instructor? A. Yes, in most cases, if done with proper care.

(41) C. L. asks: In building a telescope, the objective of which is 5 inches in diameter, how ought the lenses to be set? Focus of object glass is 72 inches. How many, and of what sizes, should the remaining lenses be? A. The object glass should be made of two lenses placed in contact. The outside lens is a double convex; the outer curve may be 49·3 inches radius, the inside curve 16 inches. The inside lens is a concavo-convex flint with the concave side fitting the crown, also of 16 inches radius, and the exterior curve of 78·4 inches radius. The eye piece may be made of two plano-convex lenses, of equal focal lengths, with their convex sides toward each other. Their distance apart should be two thirds the focal length of either. The lens toward the objective should be ¾ inch, the other ½ inch in diameter.

(42) J. T. H. says: I have been troubled for three months with heating of a sawmill mandrel, and would like to know the cause. A. See article in SCIENTIFIC AMERICAN SUPPLEMENT, No. 3, on the heating of journals.

(43) G. J. P. asks: We have 2 drying houses, 18x32 feet, with 6 lines of 4 inch cast iron pipe 25 feet long. One party says that ventilation is required, so he has cut 3 holes 18 inches square in the roof, and put a square box pipe up through the 3 holes, and then cut a hole in the end 2 feet square; but he does not think it best to make the buildings tight. I tell him he ought, in order to keep his houses warm, to keep them as tight as possible. Which is right? A. There should be some ventilation, and it had better be under control. Provide a box shaft about 16 inches square, at one end of the building, extending from near the floor to 2 feet above the roof, covered at top and with openings on the sides above the roof; at the other end of building, provide a like shaft, but short, horizontal, passing through the side of the building near the floor; in each shaft place a board valve or damper working on centers, and by means of these you can have as much or as little ventilation as the circumstances may require.

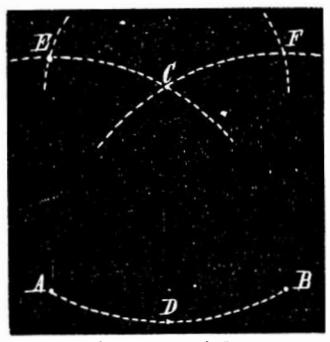
(44) F. J. F. says: In reply to a correspondent who stated that he had a boat 50 feet long by 18 feet wide and 3½ feet deep, you told him to use 2 engines of 7 inches bore by 12 inches stroke. If he puts 2 such engines in the boat, he might as well have no boat at all. I had a boat of 14 feet beam by 60 feet long; and I used 2 high pressure engines of 7 inches bore and 24 inches stroke, and all she would make up stream was 2½ or 3 miles per hour. A. Our advice to our correspondent was based upon examples of successful practice. Of course the model of the boat may affect the power required to a very great extent, as well as too small a boiler, a wasteful engine, or the like.

(45) E. H. R. says, in reply to A. E. R.'s query as to closing the drip cocks of steam heaters: If the air is out of the pipes, in either case the heat will be just the same whether the water only is run through the drip cocks or whether steam goes with the water. The pressure of steam in the pipes should be no more in either case if the back pressure valve is all right.

(46) H. L. P. says: In reply to N. W., who asked for your theory concerning the motion of the earth, you replied that "it persisted in its motion by the absence of resisting obstructions." Is not the air which presses on the surface an obstruction? A. The air which surrounds the earth is no more obstruction to its motion than is the water in the ocean, as both belong to the earth and move with it. Remember that the diameter of the earth is 8,000 miles, and the hight of the dense atmosphere only a few miles, while at the hight of 30 or 40 miles scarcely a trace is left. The earth moves with the atmosphere through the practically empty space beyond.

(47) W. P. H. says, in answer to J. D. H., who asks how to thicken his stove patterns, so as to take a heavier set of castings from them: Prepare the mold as usual, and then insert something between the top and bottom of the flask, which will separate them sufficiently for the additional thickness desired. The cavity is small, and can usually be filled by sprinkling sand on the face of the flask when open. An ingenious man can also vary the additional thickness as he desires.

(48) W. S. D. says, in reply to the question, how to construct a perfect square, with dividers or compasses only, without the aid of scale, pencil, ruler, or straight edge, or any other instrument, on a given base or a line drawn between two given points: Let A B be the given points. From



A as a center, with a radius = A B, describe the arc, E C; then with B as a center, describe the arc, F C; with C as a center, describe the arc, A D B; then again, with C as a center and a radius = A D (½ A B, measured on the arc) describe the arcs at E and F; then will the points, A, B, E, F, form a perfect square.

(49) E. H. R. says, in reply to H. F. K.'s query as to boiler capacity for a steam heater; Provide one fifth as much boiler surface (in square feet) as you have of radiating surface in the steam pipes, and you will heat your building with economy.

(50) M. R. C. says, in reply to I. O. A., who complains of the fatigue of the eyes: The trouble arises from partial paralysis of the retina or nervous coat of the eye, caused by bright white light; and it may be obviated by decomposing the rays from the lamp by means of a tinted shade. White porcelain is very good, or thin tissue paper (white, straw-colored, or such), hung between the light and the operator so as to shade the white wood, will do. If the person be short-sighted he may require a concave glass to suit the sight. If he be long-sighted from advancing years, weak lenses may be required. If the glasses are suitable for the sight, and the fatigue continue, rest should be enjoined. Strengthen the general health; sea bathing or bathing with sea salt and water is good.

(51) S. says, in reply to A.'s query as to how to get a good color on casehardened goods: Use leather scraps for the purpose. The leather should be charred sufficiently to pulverize easily, and then be pounded, not too fine, say about the size of peas. The articles should be imbedded in this in an iron box, luted with clay, and heated red hot for from 1 to 6 or more hours, as they are to be hardened to a greater or less depth, and then dumped into cold water and dried off before they rust.

(52) M. R. C. S. says, in reply to J. H. I.: The splitting of the nails may be due to dry heat, as of a stove during cold weather. Keep the nails cut short; do not scrape or file the surfaces; moisten with a little glycerin or almond oil to which a little *liquor potassæ* has been added. The nails becoming concave is not, I believe, due to debility always, as I have seen it in one case where the person was well nourished.

(53) A. W. C. says, in reply to R. I. S., who asks how to settle rain water: The best plan that has as yet been found in Canada is to put about 2 ozs. powdered alum and 2 ozs. borax into a twenty barrel cistern of black rain water; in a few hours the water will be purified, and comparatively waste water may thus be made fit for cooking purposes. This mixture has the same effect on lime water, precipitating the offensive particles to the bottom of the receptacle.

(54) A. W. C. says, in answer to T. B., who asks as to using potatoes for manufacturing purposes: Desiccated potatoes have long been used as an article of diet by the naval and mercantile marine of Great Britain; and they were the staple diet of the explorers of the northwest passage under McClintock.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined, with the results stated:

Dr. T.—It contains 85 per cent lead and a trace of silver, but no gold.—J. M. McW.—It is kaolin clay.—R. T. W.—No. 1 is mud shale, containing pyrites. No. 2 is hardened blue clay.

COMMUNICATIONS RECEIVED.

The Editor of the SCIENTIFIC AMERICAN acknowledges, with much pleasure, the receipt of original papers and contributions upon the following subjects:

On Drawbridges. By C. V. W.
On the Tails of Comets By E. B.
On a New Wash Bottle. By W. K.
On a New Motor. By T. H.
On a Double Channel Theory. By W. T. C.
On a Boiler Explosion. By G. H. K.
On Working Men at the Centennial. By W.P.E.
On a Meteor. By E. S.
On Bored Wells. By R. A. R.
On Cleansing Water Mains. By H. O. A.
On Penguins. By W. E. D.

Also inquiries and answers from the following: H. D.—G. R —J. T. B.—J. W. P.—W. T. C.—E. G.B. —H. V. M.—E. T. H.—W. M.—J. C.—G. C.—J. C. D. —J. S.—C. S.—J. G. A.—R. M.—J. C. W.—W. D.— F. O. J.—N. P.—W. B. W.

HINTS TO CORRESPONDENTS

Correspondents whose inquiries fail to appear should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them. The address of the writer should always be given.

Enquiries relating to patents, or to the patentability of inventions, assignments, etc., will not be published here. All such questions, when initials only are given, are thrown into the waste basket, as it would fill half of our paper to print them all; but we generally take pleasure in answering briefly by mail, if the writer's address is given.

Hundreds of inquiries analogous to the following are sent: "Who sells miniature locomotive engines? Who makes the best steam pumps? Who sells mica lamp chimneys? Who makes paper barrels? Who sells millstones? Whose is the best glue? Why do not makers of electric telegraph apparatus advertise in the SCIENTIFIC AMERICAN?" All such personal inquiries are printed, as will be observed, in the column of "Business and Personal," which is specially set apart for that purpose, subject to the charge mentioned at the head of that column. Almost any desired information can in this way be expeditiously obtained.

[OFFICIAL.]

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8,905.—STOVE.—R. Backus, Albany, N. Y.
8,906.—BUTTONS.—I. Lehman, New York, city.
8,907.—KETTLE.—J. Lundgren, New York city.
8,908.—KETTLES.—J. Wiley, Allegheny, Pa.
8,909, 8,910.—CUTLERY HANDLES.—E. L. Brittin, Derby, Conn., *et al.*
8,911.—CUTLERY.—L. Brittin, Derby, Conn.
8,912.—TEA SET HANDLES.—J. Hall, Boston, Mass.
8,913.—BUCKLES.—W. L. Starr, Newark, N. J.
8,914 to 8,916.—CARPETS.—J. Hamer, Dutchess co., N. Y.
8,917 to 8,919.—CARPETS.—A. Heald, Philadelphia, Pa.
8,920.—GRATE.—F. A. Magee, Chelsea, Mass.
8,921.—HARNESS TRIMMINGS.—S. Wiener, Newark, N. J.

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CANADIAN PATENTS.

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5,584.—J. C. Rorick, Wauseon, Ohio, U. S. Square and miter bar. Jan. 10, 1876.
5,585.—T. M. Carroll, Oelwein, Iowa, U. S. Apparatus for heating water. Jan. 10, 1876.
5,586.—J. L. Little, Muncie, Ind., U. S. Duster. Jan. 10, 1876.
5,587.—C. Carpenter, Hamilton, Ont. Extension of No. 785. Door knob. Jan. 13, 1876.
5,588.—R. W. Drew *et al.*, Montreal, P. Q. Lubricating cup. Jan. 15, 1876.
5,589.—L. D. Craig, San Francisco, Cal., U. S. Tenon fastener for chairs, etc. Jan. 18, 1876.
5,590.—J. Keith, Providence, R. I., U. S. Sewing machine. Jan. 18, 1876.
5,591.—G. S. Tiffany, London, Ont. Brick-making machine. Jan. 18, 1876.
5,592.—W. W. Jilz, St. Louis, Mo., U. S. Well auger. Jan. 18, 1876.
5,593.—T. W. Lion, Brentsville, Va., U. S. Making illuminating gas. Jan. 20, 1876.
5,594.—J. O. Montignani, Albany, N. Y., U. S. Mop and brush holder. Jan. 20, 1876.
5,595.—R. S. Morse, Wilton, Me., U. S. Washing machine. Jan 20, 1876.
5,596.—N. Cassitt, Brockville, Ont. Mowing machine frame. Jan. 20, 1876.
5,597.—J. B. Winters, London, Ont. Bridge. Jan. 20, 1876.
5,598.—G. M. Fuller, Holyoke, Mass., U. S. Manufacture of pipes. Jan. 20, 1876.
5,599.—S. Bretzfield *et al.*, New York city, U. S. Recording apparatus for billiard games. Jan. 20, 1876.
5,600.—R. H. Isbell, New Milford, Conn., U. S. Ornamenting buttons. Jan. 20, 1876.
5,601.—D. J. Miller, Santa Fé, New Mex., U. S. Calendar. Jan. 20, 1876.
5,602.—W. Bohren, Montreal, P. Q. Hand rest for pianos. Jan. 20, 1876.
5,603.—A. Payette, Montreal, P. Q. Axle. Jan. 20, 1876.
5,604.—G. MacLellan, Glasgow, Scotland. India rubber compounds. Jan. 20, 1876.
5,605.—O. Adams, Battle Creek, Mich., U. S. Rotary steam engine. Jan. 20, 1876.
5,606.—R. A. McCauley, Baltimore, Md., U. S. Apparatus for cleaning sinks, etc. Jan. 20, 1876.
5,607.—M. Wilson, Strathroy, Ont. Sulky harrow and hay rake. Jan. 20, 1876.
5,608.—M. H. Strong, Brooklyn, N. Y., U. S. Making illuminating gas. Jan. 20, 1876.
5,609.—J. Chapman, St. John, N. B. Street lamp lighter. Jan. 20, 1876.
5,610.—W. E. Gard, New York city, U. S. Brick handling apparatus and truck. Jan. 20, 1876.
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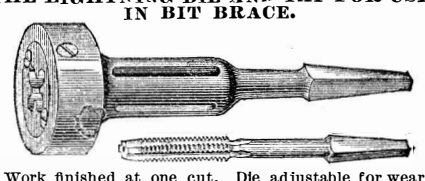

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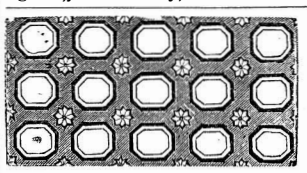

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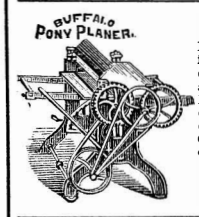

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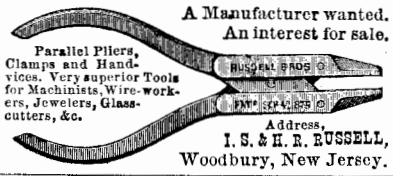

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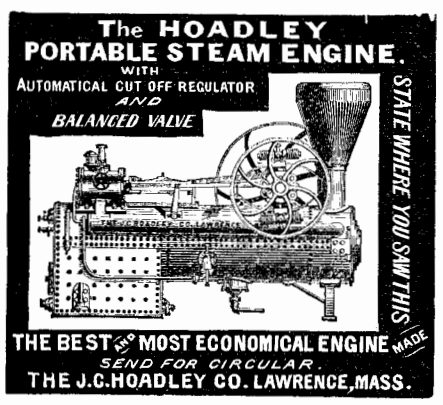

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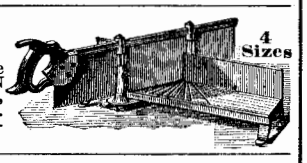

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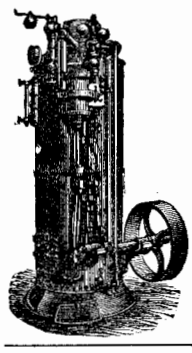

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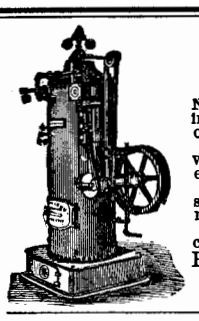

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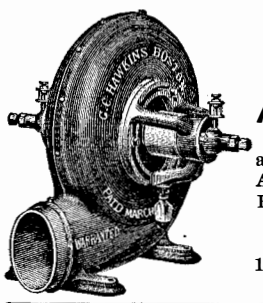

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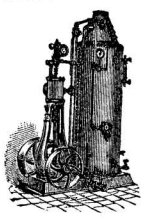

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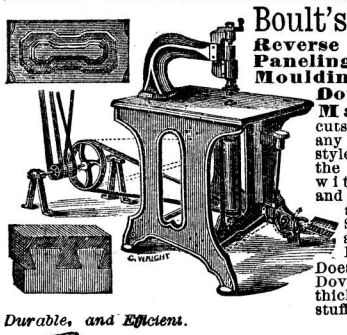

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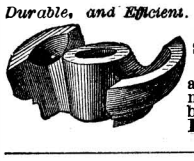

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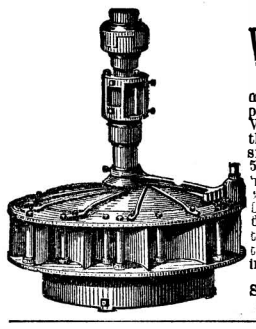

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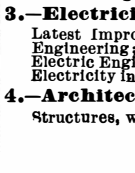

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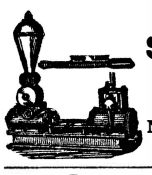

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